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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

List of Tables

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

LIST OF FIGURES (CONTINUED)

List of Appendices

Note: Product names used in this publication are included for completeness but do not constitute product endorsement.

LIST OF ACRONYMS

AABM	Aggregate Abundance Based Management
AI	Abundance Index
ADF&G	Alaska Department of Fish & Game
AEQ	Adult Equivalent
AUC	Area-Under-the-Curve
AWG	Analytical Working Group of the CTC
BY	Brood Year
BYER	Brood Year Exploitation Rate
DFO	Department of Fisheries and Oceans Canada
CLB	Calibration
CNR	Chinook Nonretention
CRITFC	Columbia River Intertribal Fish Commission
CTC	Chinook Technical Committee
CWTIP	Coded Wire Tag Improvement Program
CWTIT	Coded Wire Tag Improvement Team
CY	Calendar Year
CWT	Coded Wire Tag
DIT	Double Index Tag
ERA	Exploitation Rate Analysis
FI	Fishery Index
EV	Environmental Variable scalar
FNC	First Nations Caucus
IM	Incidental Mortality
LC	Landed Catch
ISBM	Individual Stock Based Management
MSE	Mean Squared Error
MSF	Mark-Selective Fishery
NA	Not Available
NBC	Northern B.C. Dixon Entrance to Kitimat including Haida Gwaii
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NWIFC	Northwest Indian Fisheries Commission
ODFW	Oregon Department of Fish & Wildlife
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
QIN	Quinault Nation
ROM	Ratio of Means
SEAK	Southeast Alaska Cape Suckling to Dixon Entrance
SPS	South Puget Sound
SPFI	Stratified Proportional Fishery Index
UAF	University of Alaska Fairbanks
USFWS	U.S. Fish & Wildlife Service
WA/OR	Ocean areas off Washington and Oregon North of Cape Falcon
WCVI	West Coast Vancouver Island excluding Area 20
WDFW	Washington Department of Fish and Wildlife

Executive Summary

The Pacific Salmon Treaty (PST) requires the Chinook Technical Committee (CTC) to report annual catches, harvest rate indices, estimates of incidental mortality (IM) and exploitation rates for all Chinook fisheries and stocks harvested within the Treaty area. The CTC provides an annual report to the Pacific Salmon Commission (PSC) to fulfill this obligation as agreed by Canada and the U.S. under Chapter 3 of the Treaty. This report contains four sections: Exploitation Rate Analysis (ERA), model calibration and output, evaluation of mark-selective fisheries (MSFs), and program improvements to the coastwide coded wire tag (CWT) program. Additionally, this report contains the results of the annual exploitation rate assessment of CWT data through 2011 (U.S. stocks) and 2012 (Canadian stocks), the preseason Chinook model calibration results for 2013 (CLB 1308), postseason Chinook model calibration results through 2012 (CLB 1309), and the CWT Improvement program results from 2012 and planned projects for 2013. Results include the abundance indices (AIs) for the aggregate abundance-based management (AABM) fisheries and individual stock base management (ISBM) indices for each country.

AABM Abundance Indices and Associated Catches

The pre- and postseason AIs for the three AABM fisheries, Southeast Alaska (SEAK), Northern British Columbia (NBC), and West Coast Vancouver Island (WCVI) are presented in Table 1. The 2009 PST Agreement specifies that the AABM fisheries are to be managed through the use of the AIs. Each calibration provides the postseason AIs for the previous year and the preseason AIs for the current year. Preseason AIs are used to estimate the total allowable catch limits in the upcoming fishing season. Subsequently, AIs and associated allowable catches from the first postseason model calibration for a fishing year are used to track catch overages and underages, per PST subparagraph 11(a)(i).

The 2009 Agreement specifies an allowable catch for each AI for each fishery. The maximum allowable treaty catch (total catch minus any hatchery add-on and exclusion catch) by fishery and year and the observed treaty catches are shown in Table 2.

Table 1 *Abundance Indices for 1999–2013 for the SEAK, NBC, and WCVI AABM fisheries. Postseason values for each year are from the first postseason calibration following the fishing year.*

	SEAK		NBC		WCVI	
Year	**Preseason**	**Postseason**	**Preseason**	**Postseason**	**Preseason**	**Postseason**
1999	1.15	1.12	1.12	0.97	0.60	0.50
2000	1.14	1.10	1.00	0.95	0.54	0.47
2001	1.14	1.29	1.02	1.22	0.66	0.68
2002	1.74	1.82	1.45	1.63	0.95	0.92
2003	1.79	2.17	1.48	1.90	0.85	1.10
2004	1.88	2.06	1.67	1.83	0.90	0.98
2005	2.05	1.90	1.69	1.65	0.88	0.84
2006	1.69	1.73	1.53	1.50	0.75	0.68
2007	1.60	1.34	1.35	1.10	0.67	0.57
2008	1.07	1.01	0.96	0.93	0.76	0.64
2009	1.33	1.20	1.10	1.07	0.72	0.61
2010	1.35	1.31	1.17	1.23	0.96	0.95
2011	1.69	1.62	1.38	1.41	1.15	0.90
2012	1.52	1.24[1]	1.32	1.15[1]	0.89	0.76[1]
2013	1.20[1]		1.10[1]		0.77[1]	

[1] Due to changes in calibration procedures (reviewed in section 3.1.4), 2012 postseason (CLB 1309) and 2013 preseason (CLB 1308) AIs are based on different calibrations; the procedures and assumptions CLB 1309 mirror those used during the 2012 preseason calibration.

Table 2 *Preseason allowable catches for 2009–2013, and postseason allowable catches and observed catches for 2009–2012 for AABM fisheries. Postseason values for each year are from the first postseason calibration following the fishing year.*

PST Treaty Allowable and Observed Catches									
	SEAK (T, N, S)[1]			NBC (T, S)			WCVI (T, S)		
Year	**Preseason Allowable Catch**	**Postseason Allowable Catch**	**Observed Catch**	**Preseason Allowable Catch**	**Postseason Allowable Catch**	**Observed Catch**	**Preseason Allowable Catch**	**Postseason Allowable Catch**	**Observed Catch**
2009	218,800	176,000	227,667[2]	143,000	139,100	109,470	107,800	91,300	124,617
2010	221,800	215,800	229,355[2]	152,100	160,400	136,613	143,700	142,300	139,047
2011	294,800	283,300	292,028[2]	182,400	186,800	122,660	196,800	134,800	204,232
2012	266,800	205,100	241,015[2]	173,600	149,500	120,307	133,300	113,800	134,468
2013	176,000			143,000			115,300		

[1] T = troll, N = net, and S = sport.

[2] Values changed because the method used to partition gillnet catch into large and nonlarge fish has changed. This change affects the computation of the terminal exclusion, add-on, and treaty catch.

Table 3 shows the differences between the postseason allowable catches and the observed treaty catches in AABM fisheries for 2009–2012, and the cumulative deviation for those years. In SEAK, the 2012 catch was 17.5% above the postseason allowable catch, and the cumulative differences were 2.5% above. In NBC, the 2012 catch was 19.5% below the preseason allowable catch and the cumulative differences were 25.1% below. In WCVI, the 2012 catch was 18.2% above and the cumulative differences were 1.5% below the postseason allowable catch. The SEAK, NBC, and WCVI AABM fisheries have been over the preseason allowable catch 10 (SEAK), 3 (NBC), and 9 (WCVI) of the last 14 years.

Table 3 *Deviations in numbers of Chinook salmon caught and percentages from allowable catches derived from the postseason AI (Table 2) for PST AABM fisheries in 2009–2012. Postseason values for each year are from the first postseason calibration following the fishing year.*

Year	SEAK		NBC		WCVI	
	Number of Fish	Percent Difference	Number of Fish	Percent Difference	Number of Fish	Percent Difference
2009	51,667	29.4%	-29,630	-21.3%	33,317	36.5%
2010	13,555	6.3%	-23,787	-14.8%	-3,253	-2.3%
2011	8,728	3.1%	-64,140	-34.3%	69,432	51.5%
2012	35,915	17.5%	-29,193	-19.5%	20,668	18.2%
Cum.	**109,865**	**12.5%**	**-146,750**	**-22.5%**	**120,164**	**20.7%**

Overages and underages in AABM catches, relative to the first postseason calibration for a fishing year (Table 3), can arise due to the inseason management system, errors in the preseason calibration process (e.g., forecast error), or a combination of the two. The relative influence of each was evaluated by inspecting differences in actual landed catch and allowable catches from both preseason and postseason calibrations (Table 4). Regarding the inseason management system in 2012, the actual landed catch was less than the preseason allowable catch by 25,785 Chinook salmon in SEAK and by 53,293 in NBC. For WCVI, the actual landed catch was 1,168 more than the preseason allowable catch. In terms of the postseason allowable catches for evaluation of the provisions of the PST (subparagraph 11(a)(i)), actual catches exceeded the postseason allowable catches by 35,915 Chinook salmon in SEAK and by 20,668 in WCVI. Actual landed catch in NBC was 29,193 fish less than the postseason allowable catch.

Table 4 *Deviations in actual landed catch (LC), allowable landed catch determined from preseason model calibration (PreALC), and allowable landed catch determined from postseason model calibration (PostALC) for AABM fisheries from 1999 to 2012. Postseason values for each year are from the first postseason calibration following the fishing year. The difference between LC and PreALC represents the consequences of the management system employed in the year; the difference in PreALC and PostALC represents consequences of the forecast procedures and data used in forecasting the PreALC by the PSC Chinook Model. The difference in LC and PostALC captures the effects of both processes.*

	SEAK			NBC			WCVI		
Year	LC–PreALC	PreALC–PostALC	LC–PostALC	LC–PreALC	PreALC–PostALC	LC–PostALC	LC–PreALC	PreALC–PostALC	LC–PostALC
2009	8,867	42,800	51,667	-33,530	3,900	-29,630	16,817	16,500	33,317
2010	7,555	6,000	13,555	-15,487	-8,300	-23,787	-4,653	1,400	-3,253
2011	-2,772	11,500	8,728	-59,740	-4,400	-64,140	7,432	62,000	69,432
2012	-25,785	61,700	35,915	-53,293	24,100	-29,193	1,168	19,500	20,668

ISBM Indices

For ISBM fisheries, the 2009 Agreement specifies that Canada and the U.S. will reduce base period exploitation rates on specified stocks by 36.5% and 40%, equivalent to ISBM indices of 63.5% and 60% percent, respectively. This requirement is referred to as the *general obligation* and does not apply to stocks that achieve their CTC agreed escapement goal. The 2009 Agreement also specifies that for those stocks in which the general obligation is insufficient to meet the escapement goal, the Party in whose waters the stock originates shall further constrain its fisheries to an extent that is not greater than the average ISBM exploitation rate which occurred in the years 1991–1996 (Paragraph 8 (c)). This requirement is referred to as the *additional obligation*.

Postseason ISBM Indices for 2011 and 2012

Postseason ISBM indices were calculated for all stocks for 2011, and for Canadian stocks in the Canadian ISBM fishery for 2012. For 2011, six of the seven Canadian ISBM indices that could be calculated from CWT data were reduced more than required under the Agreement (Table 5). Only the WCVI ISBM index (0.650) exceeded the general obligation (0.635). Since there is no CTC-agreed escapement goal for this stock aggregate, the general obligation applies. For 2012, three of the four Canadian ISBM indices that could be calculated from CWT data were reduced more than required under the Agreement, and only the WCVI ISBM index (0.738) exceeded the general obligation (Table 3.12).

Three of the 12 U.S. ISBM indices for 2011 were reduced more than required under the 2009 Agreement. The other nine U.S. CWT-based ISBM indices exceeded either the general obligation or the additional obligation (Table 6). Seven of these stocks have CTC-agreed escapement goals and all met or exceeded their respective escapement goals, and thus are exempted from the general obligation. Nooksack and Grays Harbor stocks, both without agreed escapement goals, exceeded the general obligation. Since there are no CTC-agreed escapement goal for these stocks, the general obligation applies.

Table 5 *ISBM indices based on 2011 and 2013 PSC Chinook Model, 2011 CWT analysis, and the 2013 indices predicted from the 2013 PSC Chinook Model, for the stock groups applicable to all British Columbia ISBM fisheries as listed in Attachment IV of the Treaty.*

Stock Group	Escapement Indicator Stock	2011 Model Indices for 2011	2013 Model Indices for 2011	CWT Indices for 2011	2013 Model Indices for 2013
Lower Strait of Georgia	Cowichan[1]	0.367	0.227[2]	0.147[3]	0.362[2]
	Nanaimo	NA		NA[4,5]	
Fraser Late	Harrison River[1]	0.193	0.261	0.092[6]	0.286
North Puget Sound Natural Springs	Nooksack	0.732	0.208	0.014	0.273
	Skagit	0.731	0.208	NA	0.273
Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	0.578	0.165	0.032	0.649
Fraser Early (Spring and Summers)	Upper Fraser, Mid Fraser, Thompson	0.222	0.110	NA	0.238
West Coast Vancouver Island Falls	WCVI (Artlish, Burman, Kauok, Tahsis, Tashish, Marble)	0.491	0.778	0.650	0.227
Puget Sound Natural Summer/Falls	Skagit	0.745	0.174	NA	0.429
	Stillaguamish	0.793	0.247	0.246	0.561
	Snohomish	0.744	0.175	NA	0.423
	Lake Washington	0.752	0.225	NA	0.419
	Green River	0.756	0.225	0.300	0.419
North/Central B.C.	Yakoun, Nass, Skeena, Area 8	0.598	0.163	NA	0.496

[1] Stock or stock group with a CTC-agreed escapement goal.

[2] Although model-based indices were previously calculated separately for Cowichan and Nanaimo, these did not adequately represent impacts on either Lower Strait of Georgia stock because the model-based data represent an aggregate of the two stocks, and methods do not currently exist to correctly disaggregate these data for calculation of the ISBM values. Until such methods are developed, a single index value only will be reported representing the aggregate.

[3] An inconsistency was discovered between the approaches used to calculate the model-based and CWT-based indices. The former included harvest rates for terminal sport while the latter did not. Terminal sport harvest rates are now included in the calculation of both indices. Further review is yet required to determine whether the base period terminal sport harvest rates obtained from analyses of Big Qualicum CWT recoveries adequately represent impacts that would have occurred on Cowichan Chinook.

[4] Not available (NA) because of insufficient data (lack of stock-specific tag codes, base period CWT recoveries, etc.).

[5] Several problems have been identified in the approach previously used to calculate the CWT-based indices for Nanaimo Chinook. Until these problems are resolved, indices for this stock will not be reported.

[6] The terminal sport harvest rates for Chilliwack Hatchery Chinook, the indicator stock, were removed from the calculation for the Harrison River naturals because sport harvest has been essentially zero on the natural population.

Table 6 *ISBM indices based on 2011 and 2013 PSC Chinook Model, 2011 CWT analysis, and the 2013 indices predicted from the 2013 PSC Chinook Model, for the stock groups applicable to all Southern U.S. fisheries as listed in Attachment V of the Treaty.*

Stock Group	Escapement Indicator Stock	2011 Model Indices for 2011	2013 Model Indices for 2011	CWT Indices for 2011	2013 Model Indices for 2013
Washington Coastal Fall Naturals	Hoko	0.419	1.505	NA[1]	0.608
	Grays Harbor	0.549	0.765	0.923	0.547
	Queets[2]	0.327	0.565	NA	0.532
	Hoh[2]	0.760	0.437	2.003	0.802
	Quillayute[2]	1.058	1.469	NA	1.442
Columbia River Falls	Upriver Brights[2]	0.841	1.129	2.862	0.971
	Deschutes[2]	1.044	0.687	0.798	0.718
	Lewis[2]	0.426	0.760	0.432	0.538
Puget Sound Natural Summer/Falls	Skagit	0.789	NC[3]	NA	1.015
	Stillaguamish	0.169	NC	0.195	0.213
	Snohomish	0.211	NC	NA	0.231
	Lake Washington	0.387	NC	NA	0.404
	Green River	0.236	NC	0.439	0.331
Fraser Late	Harrison River[2]	0.497	0.542	NA	0.887
Columbia R Summers	Mid-Columbia Summers[2]	1.398	1.795	5.376	1.571
Far North Migrating Oregon Coastal Falls	Nehalem[2]	2.146	1.376	1.210	1.475
	Siletz[2]	0.643	1.105	1.068	0.679
	Siuslaw[2]	1.427	1.240	1.108	1.443
North Puget Sound Natural Springs	Nooksack	0.484	NC	0.741	0.330
	Skagit	0.271	NC	NA	0.337

[1] Not available (NA) because of insufficient data (lack of stock-specific tag codes, base period CWT recoveries, etc).
[2] Stock with a CTC-agreed escapement goal.
[3] Not able to calculate (NC) from 2013 Fisheries Regulation Assessment Model harvest projections.

Preseason ISBM Indices for 2013

Of the 13 ISBM indices for Canada, only the index for Upper Strait of Georgia was predicted to exceed the general obligation of 0.635 for Canadian ISBM fisheries in 2013 (Table 5). Since there is no CTC-agreed escapement goal for this stock aggregate, the general obligation would apply. Among the stocks with CTC-agreed escapement goals, only the ISBM index for Harrison was predicted to exceed the additional obligation of 0.250.

Eleven of the 20 U.S. ISBM indices are predicted to be above the general obligation of 0.600 or the additional obligation (Table 6). Where relevant, all of the corresponding stocks except Fraser Late are expected to meet their CTC-agreed escapement goals.

Coded Wire Tag Improvement Activities

A summary of the Coded Wire Tag Improvement Program (CWTIP) for 2012 is presented in Chapter 5. The goal of the CWTIP is to improve CWT-based estimates used for management of Chinook salmon stocks in the geographic area covered by the PST. The 2012 season represents the fourth year of the program for Canada and the third year of the program for the U.S. The Chapter 5 summary includes, over the years of the program to date, a summary of spending, performance and benefits of the CWTIP, as well as emerging and long-term issues facing the coastwide CWT program.

In 2012, the Commission approved $3 million in funding for projects. Summaries for individual projects are provided in Appendix L. Canadian projects included increased tagging for 12 CWT indicator stocks; increased escapement sampling for six stocks; program elements necessary for the Atnarko indicator stock in Central British Columbia fishing area; a substantial investment in upgrading the CWT reporting system; and improvements in sport and First Nations sampling and recovery rates, coordination and infrastructure (see Appendix Table L1). U.S.-funded projects included tagging and sampling for two CWT indicator stocks (the Stikine and Elk river stocks), CWT processing equipment for the Makah Tribe, CWT equipment (improved hand-held wands) for electronic sampling in Washington and Oregon, hand-held wands in SEAK to reduce costs of processing CWTs in commercial fisheries, estimation of CWTs in terminal sport fisheries in Puget Sound, sampling of ocean troll and sport fisheries in Washington and Oregon, data reporting improvements for the SEAK spring troll fishery, and improving the timeliness of CWT reporting in Washington (see Appendix Table M2).

1 Introduction

The Pacific Salmon Treaty (PST) requires the Chinook Technical Committee (CTC) to report annually on catches, harvest rate indices, estimates of incidental mortality (IM) and exploitation rates for all Chinook fisheries and stocks harvested within the Treaty area. To fulfill this obligation, the CTC uses a Chinook model to generate key outputs of relevance to the PSC's annual Chinook fishery management cycle. The PSC Chinook Model is calibrated each year, incorporating preseason stock-specific abundance forecasts with the latest information on catches, exploitation rates generated through cohort analysis, terminal runs and escapements. The Parties rely upon the PSC Chinook Model to generate annual estimates of abundance for aggregate abundance-based management (AABM) fisheries and indices for individual stock based management (ISBM) fisheries (Figure 1.1).

Abundance index (AI) prediction is at the heart of the PST Chinook salmon management process, because preseason AIs determine the preseason estimates of the total allowable catches for each of the three AABM fisheries. These preseason estimates of the total allowable catch drive the inseason management of AABM fisheries, because no reliable mechanism exists to update the AIs inseason. In addition to generating preseason AIs, the PSC Chinook Model provides other information of immediate relevance to PSC management, most notably postseason AIs and preseason ISBM indices. The first postseason AI estimates are used to determine the final total allowable catches to which the AABM fisheries are held accountable. The preseason ISBM indices are used to inform fishery management plans. Postseason ISBM indices are computed through a separate process using the CWT data that comes out of the exploitation rate analysis (ERA), to which ISBM fisheries are held accountable.

This report describes the methods and results of the cohort analysis used to estimate exploitation rates from CWT data (Section 2), and the PSC Chinook Model calibration (Section 3). The results of the preseason model calibration for 2013 are based on the ERA using CWT data through catch year 2011 (2012 for Canadian stocks); coastwide data on catch, spawning escapements, and age structure through 2012; and forecasts of Chinook salmon returns expected in 2013. Additionally, this report includes reviews of recent Chinook-directed MSFs (Section 4) and summarizes the activities associated with the implementation coastwide CWTIP prescribed under the 2009 Agreement (Section 5).

Of particular interest to PST implementation, this report includes, among other model outputs: (1) estimated postseason AIs for 1979 through 2012 and the preseason projection for 2013 for the AABM fisheries; (2) estimated ISBM indices, previously referred to as nonceiling indices, in this report, for 1999–2011 and modeled ISBM projections for the 2013 ISBM fisheries; (3) estimated stock composition for 1979–2012 and a projection for 2013 for the AABM and other fisheries; and (3) estimated fishery indices (harvest rates) for the AABM fisheries.

Appendix A shows the relationship between the exploitation rate indicator stocks, escapement indicator stocks, model stocks, and PST Annex stocks. Appendices B to I present additional output from the ERA and model calibration beyond the summaries presented in the main body of the report. Appendix B provides the time series of ISBM CWT indices and ISBM model indices from the final preseason calibration. Appendix C shows the percent distribution of total mortality by catch year for exploitation rate indicator stocks. Appendices D (AABM only, tables)

and E (all fisheries, figures) show the model estimates of stock composition in AABM and other sport and troll fisheries. Appendix F lists the IM rates used in the PSC Chinook Model. Appendix G gives the time series of total AIs for the AABM fisheries, and Appendix H provides the AIs for each model stock for each AABM fishery. Appendix I presents the time series of CWT-based fishery exploitation rate indices by stock, age, and fishery. Appendix J provides a graphical summary of forecast error for Chinook model stocks. CWT data quality and model calibration issues, as well as their resolution, are detailed in Appendix K, and Appendix L contains narratives for projects that were funded by the CWTIP and active during fiscal year 2012.

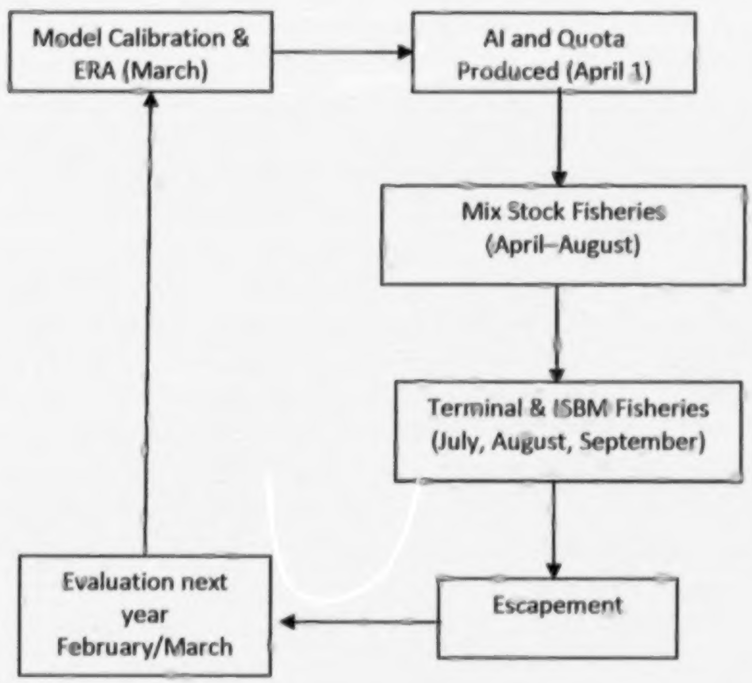

Figure 1.1 PST Chinook management process and fishery timings.

2 Exploitation Rate Analysis

The CTC currently monitors 45 CWT-tagged exploitation rate indicator stocks (Figure 2.1; Table 2.1). The exploitation rate assessment is performed through cohort analysis, a procedure that reconstructs the cohort size and exploitation history of a given stock and brood year (BY) using CWT release and recovery data (CTC 1988). The analysis provides stock-specific estimates of BY total, age- and fishery-specific exploitation rates, maturation rates, age 2 or 3 survival indices, annual distributions of fishery mortalities, fishery indices for AABM fisheries, and ISBM indices for ISBM fisheries (Table 2.2). Estimates of age- and fishery-specific exploitation and maturation rates from the cohort analysis are combined with data on catches, escapements, incidental mortalities, and stock enhancement to complete the annual calibration of the PSC Chinook model.

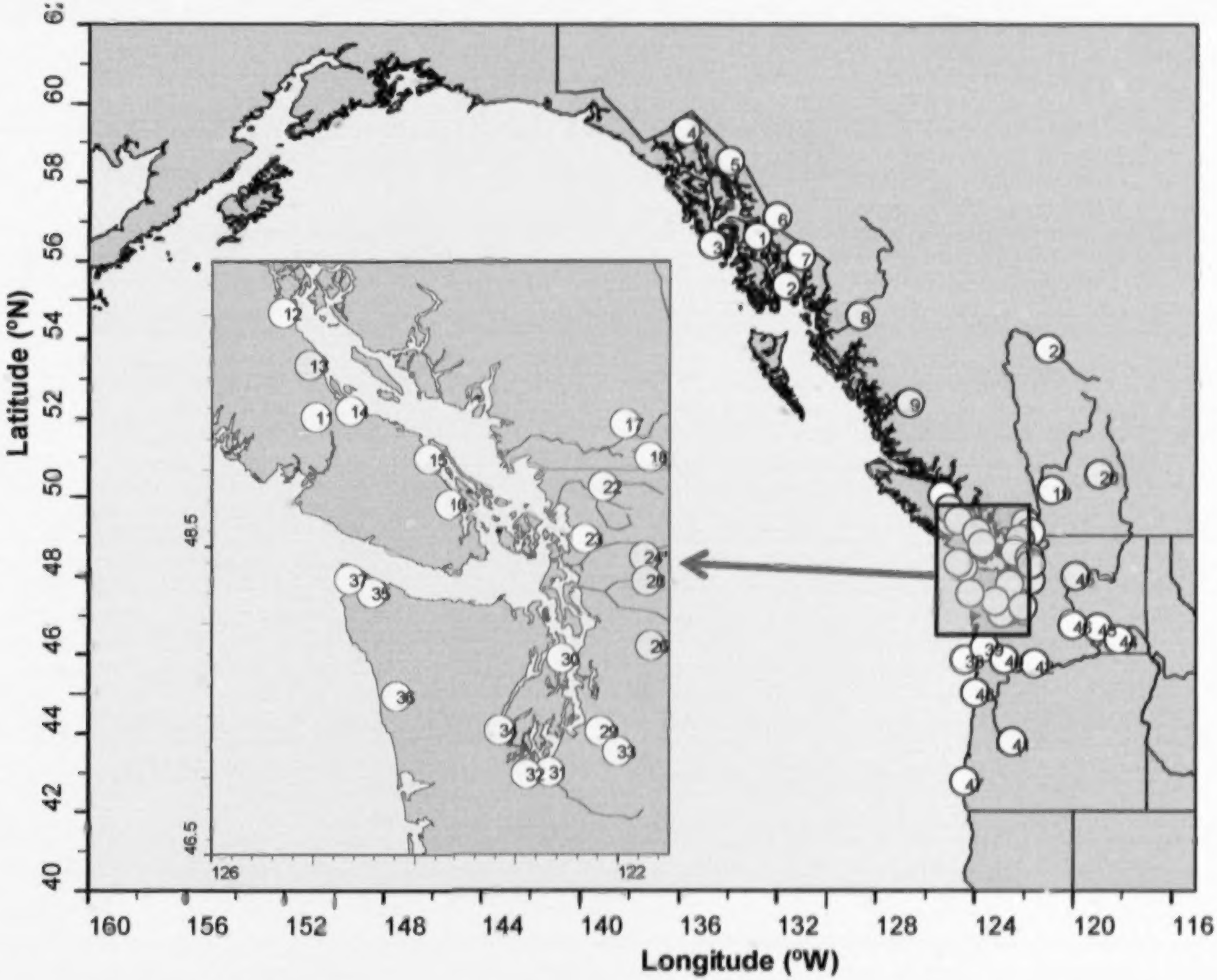

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Figure 2.1 Geographical location of all past and present Chinook salmon CWT indicator stocks.

Note: Color of the filled circles indicates adult run timing: yellow = spring, aquamarine = summer and white = fall. The southern B.C. and Puget Sound area, where concentration of the CWT indicators is greatest, is shown in expanded view. Numbered circles indicate the CWT indicators as follows:

1	AKS (ACI)
2	AKS (ADM)
3	AKS (ALP)
3	CHK
5	TAK
6	STI
7	UNU
8	KLM/KLY
9	ATN/ATS
11	RBT
12	QUI
13	PPS
14	BQR
15	NAN
16	COW
17	HAR
18	CHI
19	NIC
20	SHU
21	DOM
22	NSF
23	SAM
24*	Skagit spring and Summer/Fall stocks (SKS/SKF/SSF)
26	SKY
28	STL
29	SPS(GRN)
30	SPS(GRO)
31	NIS
32	SPY
33	WRY
34	GAD
35	HOK
36	QUE
37	SOO
38	CWF
39	LRH
40	LRW
41	WSH
42	SPR
43	HAN
44	LYF
45	SUM
46	URB
47	ELK
48	SRH

Note: See Table 2.1 for the full stock names associated with each abbreviation. Not all stock indicators listed above are current. Only indicator stocks run now are in Table 2.1.

Table 2.1 Current CWT exploitation rate indicator stocks, their location, run type, and smolt age.

Stock/Area	Exploitation Rate Indicator Stocks	Hatchery	Run Type	Smolt Age
Southeast Alaska	Alaska Spring (AKS)	Crystal Lake, Whitman Lake, Little Port Walter, Deer Mountain, Neets Bay	Spring	Age 1
	Chilkat (CHK)	Wild	Spring	Age 1
	Taku (TAK)	Wild	Spring	Age 1
	Unuk (UNU)	Wild	Spring	Age 1
North/Central B.C.	Atnarko (ATN)	Snootli	Summer	Age 0
	Kitsumkalum (KLM)	Deep Creek	Summer	Age 1
WCVI	Robertson Creek (RBT)	Robertson Creek	Fall	Age 0
Strait of Georgia	Big Qualicum (BQR)	Big Qualicum	Fall	Age 0
	Cowichan (COW)	Cowichan	Fall	Age 0
	Nanaimo (NAN)	Nanaimo	Fall	Age 0
	Puntledge (PPS)	Puntledge	Summer	Age 0
	Quinsam (QUI)	Quinsam	Fall	Age 0
Fraser River	Chilliwack (Harrison Stock)[1] (CHI)	Chilliwack	Fall	Age 0
	Dome (DOM)	Penny Creek	Spring	Age 1
	Harrison (HAR)	Chehalis	Fall	Age 0
	Lower Shuswap (SHU)	Shuswap Falls	Summer	Age 0
	Nicola (NIC)	Spius Creek	Spring	Age 1
North Puget Sound	Nooksack Spring Fingerling (NKF)	Kendall Creek	Spring	Age 0
	Nooksack Spring Yearling (NKS)	Kendall Creek	Spring	Age 1
	Samish Fall Fingerling[1] (SAM)	Samish	Summer/Fall	Age 0
	Skagit Spring Fingerling (SKF)	Marblemount	Spring	Age 0
	Skagit Spring Yearling[1] (SKS)	Marblemount	Spring	Age 1
	Skagit Summer Fingerling (SSF)	Marblemount	Summer	Age 0
Central Puget Sound	Skykomish Sum. Fingerling[1] (SKY)	Wallace	Summer/Fall	Age 0
	Stillaguamish Fall Fingerling (STL)	Stillaquamish Tribal	Summer/Fall	Age 0
South Puget Sound	Nisqually Fall Fingerling[1] (NIS)	Clear Creek	Summer/Fall	Age 0
	S. Puget Sound Fall Fingerling[1] (SPS)	Soos /Grovers/Issaquah creeks	Summer/Fall	Age 0
	South Puget Sound Fall Yearling (SPY)	Tumwater Falls	Summer/Fall	Age 1
	White River Spring Yearling[2] (WRY)	White River	Spring	Age 1
Hood Canal	George Adams Fall Fingerling[1] (GAD)	George Adams	Summer/Fall	Age 0
Juan de Fuca	Elwha Fall Fingerling (ELW)	Lower Elwha	Summer/Fall	Age 0
North Washington Coast	Hoko Fall Fingerling (HOK)	Hoko Makah National Fish Hatchery	Fall	Age 0
	Queets Fall Fingerling (QUE)	Wild broodstock, Salmon River (WA)	Fall	Age 0
	Sooes Fall Fingerling (SOO)	Makah National Fish Hatchery	Fall	Age 0
Lower Columbia River	Columbia Lower River Hatchery[1] (LRH)	Big Creek	Fall Tule	Age 0
	Cowlitz Tule (WA) (CWF)	Cowlitz	Fall Tule	Age 0
	Lewis River Wild (LRW)	Wild	Fall Bright	Age 0
	Spring Creek Tule (WA)[1] (SPR)	Spring Creek National Fish Hatchery	Fall Tule	Age 0
	Willamette Spring[1] (WSH)	Willamette Hatchery	Spring	Age 1
Upper Columbia River	Columbia Summers[3] (WA) (SUM)	Wells	Summer	Age 0/1
	Columbia Upriver Bright (URB)	Priest Rapids	Fall Bright	Age 0
	Hanford Wild (HAN)	Wild	Fall Bright	Age 0
Snake River	Lyons Ferry[1,4] (LYY/LYF)	Lyons Ferry	Fall Bright	Age 0
North Oregon Coast	Salmon (SRH)	Salmon	Fall	Age 0
Mid Oregon Coast	Elk River (ELK)	Elk River	Fall	Age 0

[1] Double index tags (DIT) associated with this stock.

[2] No longer adipose fin clipped.

[3] Model base period tag groups are fingerlings, ERA tag groups are a combination of fingerlings and yearlings.

[4] Subyearlings have been CWT-tagged since BY 1986, except for BYs 1993–1997.

Table 2.2 The CWT exploitation rate indicator stocks used in the ERA and the data derived from them: fishery, ISBM and survival indices, brood year exploitation rates (BYER), and stock catch distribution (Dist) with quantitative escapement estimates (Esc) and tagging during base years 1979–1982.

Exploitation Rate Indicator Stock	Fishery Index	ISBM Index	BYER[1]	Survival Index	Dist	Esc	Base Tagging
Alaska Spring (AKS)	Yes	—	Ocean	Yes	Yes	Yes	Yes
Chilkat (CHK)	—	—	Total	Yes	Yes	Yes	—
Taku (TAK)	—	—	Total	Yes	Yes	Yes	—
Unuk (UNU)	—	—	Total	Yes	Yes	Yes	—
Atnarko (ATN)	Yes	No	Total	Yes	Yes	Yes	Yes
Kitsumkalum (KLM)	—	—	Total	Yes	Yes	Yes	—
Robertson Creek (RBT)	Yes	Yes	Ocean	Yes	Yes	Yes	Yes
Big Qualicum (BQR)	Yes	Yes	Total	Yes	Yes	Yes	Yes
Cowichan (COW)	Yes	Yes	Total	Yes	Yes	Yes	—
Nanaimo (NAN)	—	Yes	Total	Yes	Yes	Yes	Yes
Puntledge (PPS)	Yes	—	Total	Yes	Yes	Yes	Yes
Quinsam (QUI)	Yes	Yes	Total	Yes	Yes	Yes	Yes
Chilliwack (Harrison Fall Stock) (CHI)	—	Yes	Total	Yes	Yes	Yes	—
Dome (DOM)	—	—	Total	Yes	Yes	Yes	—
Harrison (HAR)	—	—	Total	Yes	Yes	Yes	—
Lower Shuswap (SHU)	—	—	Total	Yes	Yes	Yes	Yes
Nicola (NIC)	—	—	Total	Yes	Yes	Yes	—
Nooksack Spring Fingerling (NSF)	—	—	—[2]	—	Yes	Yes	—
Nooksack Spring Yearling (NKS)	—	Yes	—[2]	Yes	Yes	Yes[3]	—
Samish Fall Fingerling (SAM)	Yes	—	Ocean	Yes	Yes	Yes[3]	Yes
Skagit Spring Fingerling (SKF)	—	—	Ocean	—	Yes	Yes	—
Skagit Spring Yearling (SKS)	—	—	Ocean	Yes	Yes	Yes[3]	—
Skagit Summer Fingerling (SSF)	—	—	Ocean	—	Yes	Yes	—
Skykomish Summer Fingerling (SKY)	—	Yes	—[2]	—	Yes	—	—
Stillaguamish Summer Fingerling (STL)	—	Yes	—[2]	—	Yes	—	—
Nisqually Fall Fingerling (NIS)	—	—	—[2]	—	Yes	—	Yes
South Puget Sound Fall Fing. (PSF)	Yes	Yes	Ocean	Yes	Yes	Yes[3]	Yes
South Puget Sound Fall Yearling (PSY)	Yes	—[4]	—[4]	Yes	Yes	Yes[3]	Yes
White River Spring Yearling (WRY)	—	—	—[2]	Yes	Yes	Yes[3]	Yes
George Adams Fall Fingerling (GAD)	Yes	—[4]	—[4]	Yes	Yes	Yes[3]	Yes
Elwha Fall Fingerling (ELW)	—	—	—[2]	Yes	Yes	—	—
Hoko Fall Fingerling (HOK)	—	—	Total	Yes	Yes	Yes	—
Queets Fall Fingerling (QUE)	—	Yes	Total	Yes	Yes	—	Yes
Sooes Fall Fingerling (SOO)	—	—	Total	Yes	Yes	Yes	—
Columbia Lower River Hatchery (LRH)	Yes	—	—[4]	Yes	Yes	Yes	Yes
Cowlitz Tule (CWF)	Yes	—	Ocean	Yes	Yes	Yes	Yes
Lewis River Wild (LRW)	Yes	Yes	Total	Yes	Yes	Yes	Yes
Spring Creek Tule (SPR)	Yes	—	—[4]	Yes	Yes	Yes	—
Willamette Spring (WSH)	Yes	—	Ocean	Yes	Yes	Yes	Yes
Columbia Summers (SUM)	Yes	Yes	Total	Yes	Yes	Yes	—
Columbia Upriver Bright (URB)	Yes	Yes	Total	Yes	Yes	Yes	Yes
Hanford Wild (HAN)	—	—	Total	Yes	Yes	Yes	—
Lyons Ferry (LYF)	—	—	Total	Yes	Yes	Yes	—
Salmon River (SRH)	Yes	Yes	Ocean	Yes	Yes	Yes	Yes
Elk River (ELK)	Yes	Yes	Ocean	Yes	Yes	Yes	—

[1] For stocks of hatchery origin and subject to terminal fisheries directed at harvesting surplus hatchery production, ocean fisheries do not include terminal net fisheries. Otherwise, total fishery includes terminal net fisheries.

[2] Insufficient escapement data for ERA.

[3] Only hatchery rack recoveries are included in escapement.

[4] Stock of hatchery origin not used to represent naturally spawning stock.

2.1 ERA Methods

2.1.1 Assumptions of the CWT ERA Analyses

Assumptions for the cohort analysis and other procedures used in the ERA are summarized below. Detailed discussions of assumptions and model parameters have been reported previously (CTC 1988). Analytical results are estimates of fishery indices for AABM fisheries, the nonceiling index for ISBM fisheries, and maturation rates for some PSC Chinook Model stocks. Primary assumptions of the cohort analysis are listed below.

1. CWT recovery data are obtained in a consistent manner from year to year or can be adjusted to make them comparable. Many of the analyses rely upon indices that are computed as the ratio of a statistic in a particular year to the value associated with a base period. Use of ratios may reduce or eliminate the effect of data biases that are consistent from year to year.
2. For ocean-age-2 and older fish, natural mortality varies by age but is constant across years. Natural mortality probabilities applied by age are: age 2, 40%; age 3, 30%; age 4, 20%; and age 5 and older 10% (i.e., after fishing mortality and maturation of the age 4 cohort, 10% of the remaining immature fish die due to natural causes before moving to the next age class and before the commencement of fishing the next year).
3. All stocks within a fishery have the same size distribution at age that is constant across years.
4. The spatial and temporal catch distribution of sublegal-size fish of a given age and stock is the same as that for legal-size fish of that stock and age.
5. Incidental mortality rates per encounter are constant between years. The rates vary by fish size (legal or sublegal) and fishery, and are published by the CTC (1997) for troll and sport fisheries. The rates used in CLB 1209 are listed in Appendix G.
6. The procedures for estimating the mortality of CWT fish of legal size during periods of Chinook salmon nonretention (CNR) assume that the stock distribution in any year remains unchanged from the period of legal catch retention in the same year. However, gear and/or area restrictions during CNR fisheries are believed to reduce the number of encounters of legal-size fish. To account for this in Canadian fisheries, the number of legal encounters during the CNR fishery was adjusted by a selectivity factor. A factor of 0.34 was used for the WCVI and Strait of Georgia troll fisheries. This value was the average selectivity factor calculated from three years of observer data in the Alaska troll fishery. A factor of 0.20 was used in the North Central British Columbia troll fishery. This factor corresponds to the proportion of fishing areas that remain open during nonretention periods. A selectivity factor was not required for the SEAK troll fishery since an independent estimate of legal and sublegal encounters has been provided annually.
7. Maturation rates for BYs in which all ages have not matured (incomplete broods) are equal to the average of completed BYs. Maturation rates are stock specific.
8. Recoveries of age 4 (age 5 for spring stocks) and older Chinook salmon in ocean net

fisheries are assumed to be mature fish.

9. When using the fishery indices as a measure of change in fishery harvest rates between years, the temporal and spatial distribution of stocks in and among fisheries and years is assumed to be stable.
10. CWT recoveries used in the ERA are from adipose-clipped tagged fish. There is no adjustment to the estimate of mortality in the ERA on adipose-intact fish that must be released in fisheries under adipose-clipped mark-selective regulations.

An exploitation rate indicator stock is not used in the ERA in the following instances.

1. The number of CWT recoveries is limited, i.e., a minimum of 10 estimated recoveries for a given brood-stock-age combination).
2. There are no CWT recoveries in the spawning escapement.
3. There are fewer than four BYs with CWT recoveries.

Indicator stocks used for ERA and the type of analysis performed are shown in Table 2.2. Relationships between the exploitation rate indicator stocks, model stocks, and PST Annex stocks are provided in Appendix A.

For AABM fisheries, fishery indices are presented for both reported catch and total mortality; only total mortality indices are presented for the ISBM fisheries. The difference between reported catch and total mortality is IM, which includes mortality of legal-size fish in CNR fisheries and mortality of sublegal-size fish in both retention and CNR fisheries. Management strategies have changed considerably for fisheries of interest to the PSC since 1985. Regulatory changes have included size limit changes, extended periods of CNR in troll fisheries, and mandatory release of Chinook salmon caught in some net fisheries. Estimates of IM are crucial for assessment of total fishery impacts, yet they cannot be determined directly from CWT recovery data. There are four categories of IM that are estimated in the Chinook model and the CWT cohort analysis. Legal and sublegal fishery specific mortality rates are applied to the following types of Chinook salmon encounters.

1. Shakers: Chinook salmon below the legal size limit that are encountered, brought to the boat, and released during a Chinook salmon retention fishery.
2. Sublegal CNR: Chinook salmon below the legal size limit that are encountered, brought to the boat, and released during a Chinook salmon nonretention fishery. The mortality rate per encounter applied to sublegal CNR is the same applied to shakers.
3. Legal CNR: Chinook salmon above the legal size limit that are encountered, brought to the boat, and released during a Chinook salmon nonretention fishery.
4. Drop-off: Chinook salmon above or below the legal size limit that are encountered, but are lost from the gear before they reach the boat during either retention or nonretention fisheries. Drop-off mortality is assumed the same for legal and sublegal fish, but can vary by gear type.

The procedures used to estimate IM in the PSC Chinook Model have been described by the CTC

Analysis Work Group[1] and CTC (2004).

2.1.2 Brood Year Exploitation Rates

Brood year exploitation rates (BYER) provide a measure of the cumulative impact of fisheries upon all age classes of a stock and brood. The BYER was computed for each stock as the ratio of adult equivalent (AEQ) total fishing mortality to AEQ total fishing mortality plus escapement.

$$BYER_{BY,F} = \frac{\sum_{a=Minage}^{Maxage}\left(\sum_{f\in\{F\}} TotMorts_{BY,a,f} * AEQ_{BY,a,f}\right)}{\sum_{a=Minage}^{Maxage}\left(\sum_{f=1}^{Numfisheries} TotMorts_{BY,a,f} * AEQ_{BY,a,f} + Esc_{BY,a}\right)} \qquad \text{Equation 2.1}$$

The AEQ factor represents the proportion of fish of a given age that would, in the absence of fishing, leave the ocean to return to the terminal area.

The AEQ factor is calculated as

$$\begin{aligned} AEQ_{BY,a-1,f} &= MatRte_{a-1,BY} + (1 - MatRte_{a-1,BY}) * Surv_a * AEQ_{BY,a,f} \\ AEQ_{BY,Maxage,f} &\equiv 1.0 \end{aligned} \quad . \qquad \text{Equation 2.2}$$

See Table 2.3 for a description of notation.

The numerator of the BYER may be partitioned into components for AEQ reported catch and AEQ IM, with each component occurring in either ocean fisheries or terminal fisheries.

The exploitation rate on an indicator stock will differ from the exploitation rate on the wild stock it represents if the indicator stock is subject to terminal fisheries directed at harvesting surplus hatchery production. This difference was addressed by including only ocean fisheries in the computation of the BYER for indicator stocks that had terminal fisheries targeting hatchery fish. The method selected for each exploitation rate indicator stock is given in Table 2.2. BYERs were not computed for incomplete BYs.

2.1.3 Brood Year Survival Rates

The BY survival of CWT-tagged smolts after release is calculated for most exploitation rate indicator stocks (Table 2.2). This survival rate is frequently referred to as the marine survival of the tag group but also includes any mortality occurring in freshwater following release. Two measures of survival indices or patterns are computed: (1) survival to the age 2 (age 3 for yearling stocks) cohort based on CWT recoveries, and (2) the environmental variable (EV)

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[1] Chinook Technical Committee Analysis Work Group. Unpublished. Draft 1991 PSC Chinook Model Documentation. Chinook Technical Committee Analysis Workgroup.

determined from the calibration of the PSC Chinook model (described in the Model methods section). The CWT-based estimate is our most direct measure of a brood's survival, but this measure is not final until the brood is complete (i.e., all ages have returned to spawn). Preliminary estimates are generated, but not reported, for incomplete broods using available CWT data and average maturation rates. The EV parameter, however, provides a more current measure of the survival rates expected in BYs contributing to present and future fisheries.

For CWT data, the BY survival rate for a fingerling stock is the estimated age-2 cohort (from the cohort analysis) divided by the number of CWT fish released, whereas for yearling stocks, the survival rate is calculated for the estimated age-3 cohort.

$$CohSurv_{BY,a=2or3} = \frac{Cohort_{BY,a=2or3}}{TotCWTRelease_{BY}}$$

Equation 2.3

where $Cohort_{BY,a}$ is calculated recursively from the oldest age down to the youngest age using

$$Cohort_{BY,a} = \frac{\sum_{f=1}^{Numfisheries} TotMorts_{BY,a,f} + Esc_{BY,a} + Cohort_{BY,a+1}}{1-NM_a}.$$

Equation 2.4

If there are no CWT recoveries for the oldest ocean age of a stock, the next youngest cohort size is estimated using

$$Cohort_{BY,\max age-1} = \frac{\sum_{f\in Preterminal} TotMorts_{BY,\max age-1,f} + \dfrac{Esc_{BY,\max age-1} + \sum_{f\in Terminal} TotMorts_{BY,\max age-1,f}}{AvgMatRte_{\max age-1}}}{1-NM_{\max age-1}}.$$

Equation 2.5

For each stock, the survival rate for each BY is divided by the average survival rate for all BYs to create a survival index for each BY as

$$CohSurvIndex_{BY,a=2or3} = \frac{CohortSurv_{BY,a=2or3}}{LongTermAvgCohortSurvival}.$$

Equation 2.6

Table 2.3 Parameter definitions for all equations except those used for the SPFI.

Parameter .	Description
a =	age class
A =	set of all ages that meet selection criteria
$AEQ_{BY,a,f}$ =	adult equivalent factor in brood year *BY*, age *a*, and fishery *f* (for terminal fisheries, AEQ = 1.0 for all ages)
$CohSurv_{BY,a=2or3}$ =	cohort survival of CWT fish to age 2 or 3 for brood year *BY*
$AvgMatRte_a$=	average maturation rate for age *a*
$BPYR$ =	base period year
$BYER_{BY,f}$=	brood year exploitation rate in adult equivalent for brood year *BY* and fishery *F*
$BPISBMER_{f,a}$=	average base period ISBM exploitation rate for fishery *f* and age *a*
BY =	brood year
$Cohort_{BY,a}$=	cohort by brood year *BY* and age *a* (*where stock is implied from context*)
$Cohort_{s,BY,a}$=	cohort by stock *s*, brood year *BY* and age *a* (*where stocks are defined explicitly in a summation*)
CY =	calendar year
$CYDist_{CY,F}$=	proportion of total stock mortality (or escapement) in a calendar year *CY* attributable to a fishery or a set of fisheries *F*
CY_{end} =	end year for average
CY_{start} =	start year for average
$d_{t,s,a}$=	distribution parameter for timestep *t*, stock *s*, and age *a*
$Esc_{Y,a}$ =	escapement past all fisheries for either brood year *BY* or calendar year *CY* and age a
$ER_{s,a,f,CY}$ =	exploitation rate at age *a* divided by cohort size at age *a* for stock *s* in fishery *f* in year *CY*
$EV_{n,BY}$ =	the stock productivity scalar for iteration *n* and brood year *BY*
f =	a single fishery
$f \in \{F\}$ =	a fishery *f* within the set of fisheries of interest
F =	ocean, terminal or other sets of fisheries or spawning escapements
$FI_{f,CY}$ =	fishery exploitation rate index for fishery *f* in year *CY*
$FP_{a,s,CY,f}$=	ratio of $ER_{s,a,f,CY}$ to *BPISBMER*
$ISBMIdxCY$ =	ISBM index for calendar year *CY*
$MatRte_{a-1,BY}$ =	maturity rate at next younger age by brood year
$Maxage$ =	maximum age of stock (generally age 6 for stream tvpe stocks, age 5 for ocean type stocks)
$Minage$ =	minimum age of stock (generally age 3 for stream type stocks, age 2 for ocean type stocks)
$Morts_{CY,a,f}$ =	landed or total fishing mortality in year *CY* and age *a* in fishery *f*
NMa =	annual natural mortality prior to fishing on age *a* cohort
$Numfisheries$ =	total number of fisheries
RT_{CY} =	ratio of the catch quota in the current year to the catch that would be predicted given current abundance, current size limits, and base period exploitation rates
s =	a particular stock
S =	set of all stocks that meet selection criteria
SC_{BY} =	ratio of the estimated and model predicted terminal run for brood year *BY*
$Surv_a$ =	survival rate (1-NM_a) by age
$TotMorts_{BY,a,f}$ =	total fishing related mortality for brood year *BY* or calendar year *CY* or during the base period BPER and age *a* in fishery *f*
$TotCWTRelease_{BY}$ =	number of CWT fish released in the indicator group in brood year *BY*

2.1.4 Stock Distribution Patterns

The distributions of mortalities (reported catch and total) among fisheries and escapement in a catch year were calculated for each stock to determine the exploitation patterns. The distributions were computed if at least three BYs contributed to the CWT recoveries for a catch year. Distributions were computed for each fishery across all ages present in the catch year as

$$CYDist_{CY,F} = \frac{\sum_{a=Minage}^{Maxage} \sum_{f \in \{F\}} Morts_{CY,a,f} * AEQ_{BY=CY-a,a,f}}{\sum_{a=Minage}^{Maxage} \left(\sum_{f=1}^{Numfisheries} Morts_{CY,a,f} * AEQ_{BY=CY-a,a,f} + Esc_{CY,a} \right)}.$$

Equation 2.7

Mortality distribution tables may not indicate the true distribution of an indicator stock. For example, closure of a fishery would result in no CWT recoveries but this would not necessarily indicate zero abundance of the stock in that fishing area.

2.1.5 Fishery Indices

When the PST was negotiated in 1985, catch ceilings and increases in stock abundance were expected to reduce harvest rates in fisheries. The fishery index (FI) provided a means to assess performance against this expectation. Relative to the base period, an index less than 1.0 represents a decrease from base period harvest rates while an index greater than 1.0 represents an increase. While the determination of allowable catch for AABM fisheries in the 2009 Agreement is different from the original PST catch ceilings, these fishery indices continue to provide a useful index of change in harvest rates in these fisheries. Fishery indices are used to measure relative changes in fishery harvest rates because it is not possible to directly estimate the fishery harvest rates.

Fishery indices are computed in AEQs for both reported catch and total mortality (reported catch plus IM). The total mortality AEQ exploitation rate is estimated as

$$ER_{s,a,f,CY} = \frac{TotMorts_{s,a,f,CY} * AEQ_{s,BY=CY-a,a,f}}{Cohort_{s,BY=CY-a,a} * (1 - NM_a)},$$

Equation 2.8

while the reported catch AEQ exploitation rate is estimated as

$$ER_{s,a,f,CY} = \frac{RepMorts_{s,a,f,CY} * AEQ_{s,BY=CY-a,a,f}}{Cohort_{s,BY=CY-a,a} * (1 - NM_a)},$$

Equation 2.9

and a ratio of means (ROM) estimator is used to calculate the fishery index (FI)

$$FI_{f,CY} = \frac{\sum_{s\in\{S\}}\sum_{a\in\{A\}} ER_{s,a,f,CY}}{\left(\frac{\sum_{BPYR=79}^{82}\sum_{s\in\{S\}}\sum_{a\in\{A\}} ER_{s,a,f,BPYR}}{4}\right)}. \qquad \textit{Equation 2.10}$$

For AABM fisheries, indices are presented for troll gear only, although the catch limitations also apply to recreational fisheries and net fisheries in SEAK and the recreational fisheries in NBC and WCVI. As in past years, recoveries from the troll fishery were used because the majority of the catch and the most reliable CWT sampling occur in these fisheries. In addition, there are data limitations in the base period for the sport fisheries (e.g., few observed recoveries in NBC due to small fishery size). Because the allocation of the catch among gear types has changed in some fisheries (e.g., the proportion of the catch harvested by the sport fishery has increased in all AABM fisheries), the indices may not represent the harvest impact of all gear types.

The CTC uses fishery indices to reflect changes in fishery impacts relative to the base period (catch years 1979–1982). The ROM estimator of the fishery index limits inclusion of stocks to those with adequate tagging during the base period, but fishing patterns for some fisheries have changed substantially since the base period and some stocks included in the index are no longer tagged (e.g. University of Washington Accelerated). One example of a change in the fishing pattern is for the SEAK troll fishery where the catch during the winter season has increased, the spring fishery has been largely curtailed, and the summer season has become markedly shorter. Because stock distributions are dynamic throughout the year, stock-specific impacts of the SEAK fishery have likely changed over time.

To account for changes in stock composition and to include stocks without base period data, the CTC has created alternative derivations of fishery indices (CTC 1996).The CTC determined that a useful fishery index should reflect both changes in harvest rates and stock distribution. Three general, desirable characteristics were identified:

1. The index should measure changes in fishery harvest rates if the distribution of stocks is unchanged from the base period.
2. The index should have an expected value of 1.0 for random variation around the base period fishery harvest rate, cohort size, and stock distributions.
3. The index should weight changes in stock distribution by abundance.

After exploring several alternatives, the CTC concluded that the best estimate for a fishery index would consist of the product of a fishery harvest rate index and an index of stock abundance weighted by average distribution (i.e., the proportion of a cohort vulnerable to the fishery). To that effect a report by the CTC (2009a) stated that for all AABM fisheries the stratified proportional harvest rate index (SPFI) was the most accurate and precise in estimating the harvest rate occurring in a fishery.

For computation of the SPFI, the CWT harvest rate ($h_{t,CY}$) must initially be set to an arbitrary value between 0 and 1. Then, the distribution parameter ($d_{t,s,a}$) is calculated (Equation 2.11),

and the result is substituted into Equation 2.12 to recursively recalculate $h_{t,CY}$ and subsequently $d_{t,s,a}$. The largest stock-age distribution parameter in a stratum is then set to 1 to create a unique solution. See Table 2.4 for notation description.

$$d_{t,s,a} = \sum_{CY} r_{t,CY,s,a} \Big/ \sum_{CY} \left(h_{t,CY} * n_{CY,s,a}\right)$$

Equation 2.11

$$h_{t,CY} = \sum_{s}\sum_{a} r_{t,CY,s,a} \Big/ \sum_{s}\sum_{a} \left(d_{t,s,a} * n_{CY,s,a}\right)$$

Equation 2.12

The resulting unique solution is inserted into the following equations to compute the yearly harvest rates for each strata and the overall fishery.

$$H_{t,CY} = \left[\left(\frac{\sum_{s}\sum_{a} c_{t,CY,s,a}}{\sum_{s}\sum_{a} r_{t,CY,s,a}}\right) * \left(C_{t,CY} - A_{t,CY}\right)\right] \Big/ \left[\left(C_{t,CY} - A_{t,CY}\right) / h_{t,CY}\right]$$

Equation 2.13

$$H_{CY} = \sum_{t}\left[\left(\frac{\sum_{s}\sum_{a} c_{t,CY,s,a}}{\sum_{s}\sum_{a} r_{t,CY,s,a}}\right) * \left(C_{t,CY} - A_{t,CY}\right)\right] \Big/ \sum_{t}\left[\left(C_{t,CY} - A_{t,CY}\right) / h_{t,CY}\right]$$

Equation 2.14

$$S_{t,CY} = H_{t,CY} \Big/ \sum_{CY=1979}^{1982} H_{t,CY}$$

Equation 2.15

$$S_{CY} = H_{CY} \Big/ \sum_{CY=1979}^{1982} H_{CY}$$

Equation 2.16

Table 2.4 Parameter descriptions for equations used for the SPFI.

Parameter	Description
$A_{t,CY}$ =	Alaska hatchery origin catch by strata *t*, year *CY*
$c_{t,CY,s,a}$ =	adult equivalent CWT catch by strata *t*, year *CY*, stock *s* and age *a*
$C_{t,CY}$ =	catch by strata *t*, year *CY*
$d_{t,s,a}$ =	distribution parameter by strata *t*, stock *s* and age *a*
$h_{t,CY}$ =	CWT harvest rate by strata *t*, year *CY*
H_{CY} =	harvest rate by year *CY*
$H_{t,CY}$ =	harvest rate by strata *t*, year *CY*
$n_{CY,s,a}$ =	CWT cohort size by year *CY*, stock *s* and age *a*
$r_{t,CY,s,a}$ =	CWT recoveries by strata *t*, year *CY*, stock *s* and age *a*
$S_{.CY}$ =	SPFI by year *CY*
$S_{t,CY}$ =	SPFI by strata *t*, year *CY*

2.1.6 ISBM Indices

The CTC (1996) proposed a nonceiling fishery index as a measure of the pass-through provision in specified in the 1985 PST. This index compares an *expected* AEQ mortality (assuming base period exploitation rates and current stock abundance) with the observed AEQ mortality on a stock within a calendar year, over all non-AABM fisheries of a Party (Table 2.5). Index values less than 1.0 indicate that the exploitation rates have decreased relative to the base period. Paragraph 8(d), Chapter 3 of the 2009 PST Agreement directs the CTC to use these ISBM indices to measure the performance of ISBM fisheries:

"(d) unless otherwise recommended by the CTC and approved by the Commission, the non-ceiling index defined in CTC (2005) where data are available for the required time periods, the average total annual AEQ mortality rate that occurred in 1991 to 1996, or an alternative metric recommended by the CTC and approved by the Commission will be used to monitor performance of ISBM fisheries relative to the obligations set forth in this paragraph;"

Table 2.5 Fisheries included in the ISBM index by nation.

Fisheries Included in ISBM Index	
United States	**Canada**
Washington/Oregon Ocean Troll	Central B.C. Troll
Puget Sound Northern Net	Strait of Georgia Troll
Puget Sound Southern Net	North B.C. Net
Washington Coastal Net	Central B.C. Net
Freshwater Terminal Net	West Coast Vancouver Island Net
Washington/Oregon Ocean Sport	Strait of Juan de Fuca Net
Puget Sound Northern Sport	Johnstone Strait Net
Puget Sound Southern Sport	Fraser Net
Freshwater Terminal Sport	Freshwater B.C. Net
	Strait of Georgia Sport
	Strait of Juan de Fuca Sport
	Freshwater B.C. Sport

The ISBM index is computed as

$$ISBMIdx_{CY} = \frac{\sum_{f \in \{F\}} \sum_{a=Minage}^{Maxage} \left(TotMorts_{CY,f,a} * AEQ_{BY=CY-a,a,f}\right)}{\sum_{f \in \{F\}} \sum_{a=Minage}^{Maxage} \left(BPISBMER_{f,a} * Cohort_{BY=CY-a,a}\right)}, \quad \textit{Equation 2.17}$$

where

$$BPISBMER_{f,a} = \frac{\sum_{BPER=79}^{82} \frac{\left(TotMorts_{BPER,f,a} * AEQ_{BY=BPER-a,a,f}\right)}{Cohort_{BY=BPER-a,a}}}{4}. \quad \textit{Equation 2.18}$$

Direct application of the PSC Chinook salmon model alone or CWT data alone was not possible in the computation of all ISBM indices; some fisheries required a finer resolution than the CTC model currently provides, or some terminal fisheries target only marked hatchery fish, which makes the estimated CWT-based exploitation rate nonrepresentative of the untagged stocks. In those instances the following methods were used.

For terminal fisheries with marked harvest rates that were not representative of the untagged stocks of interest, external estimates were used instead of model estimates. For preseason estimates, the Fisheries Regulation Assessment Model was used to generate external estimates for Puget Sound net and sport fisheries, and the Columbia River Harvest Model was used to generate external estimates for Columbia River net and sport fisheries. For postseason CWT-based estimates, base period exploitation rates for the model stock associated with the wild stock were used if the indicator stock did not have base period recoveries.

Many ISBM fisheries or stock/fishery combinations have no preseason predictions of harvest rates and some have no abundance forecasts. In those cases, the previous year's harvest rates were assumed.

2.2 Results

In this section, key ERA results are reviewed on a region-by-region basis and discussed briefly in terms of general patterns and trends at the stock and stock group level. Results are presented for the following ERA metrics: BY exploitation rate (total or ocean, depending on stock), early marine survival rate, and mortality distribution. While some of this content is germane to assessments on the effectiveness of the PST, such evaluations necessitate that other information also be considered (e.g., performance of escapement indicator stocks, AABM and ISBM fisheries, etc.). Thus, the emphasis of this section is on pattern description only, not on drawing inferences about cause-effect relationships due to changing management regimes.

2.2.1 Southeast Alaska Stocks

There are three wild CWT indicator stocks in SEAK and one hatchery CWT indicator stock used in CTC analyses. The three wild stocks are the Chilkat River (CHK), Taku River (TAK), and Unuk River (UNU). The SEAK wild stocks are not currently used to represent a Chinook Model stock, but were proposed for model stocks in 1998 and data sets were developed and maintained since in anticipation of this task. The SEAK hatchery indicator stock, Alaska Spring (AKS), is composed of tag recoveries released from five SEAK hatcheries (Little Port Walter, Crystal Lake, Neets Bay, Deer Mountain, and Herring Cove), and it is used to represent the Alaska Southern Southeast model stock, for which the escapement and age structure data comes from six wild stocks: the Unuk, Chickamin, Blossom, Keta, and King Salmon rivers, and Andrew Creek stocks. The SEAK wild and hatchery stocks enter the ocean as yearlings, and age 3 is the youngest age at which CWTs are recovered. The CHK time series begins in BY 1999, while the TAK and UNU time series begin earlier but contain BYs where no tagging occurred. The AKS time series begins in BY 1976 and includes every year since.

2.2.1.1 *Brood Year Exploitation Rates*

The BYERs computed for CHK, TAK, and UNU include recoveries from ocean and terminal fisheries. The BYER computed for AKS does not include terminal recoveries because the exploitation rate on hatchery fish in the terminal areas is not representative of the exploitation rate on SEAK wild stocks in terminal areas. The BYERs for SEAK wild stocks are relatively low (usually less than 20% for CHK and TAK, and less than 30% for UNU; Figure 2.2; Table 2.6). The AKS BYER is usually above 30%, but has been at or below 30% for the last three complete BYs (Figure 2.2; Table 2.6). The percentage of the AKS BYER that is incidental mortalities has decreased substantially since the 1980s and early 1990s. The last complete BY for AKS has the second lowest BYER in the time series (Figure 2.2; Table 2.6).

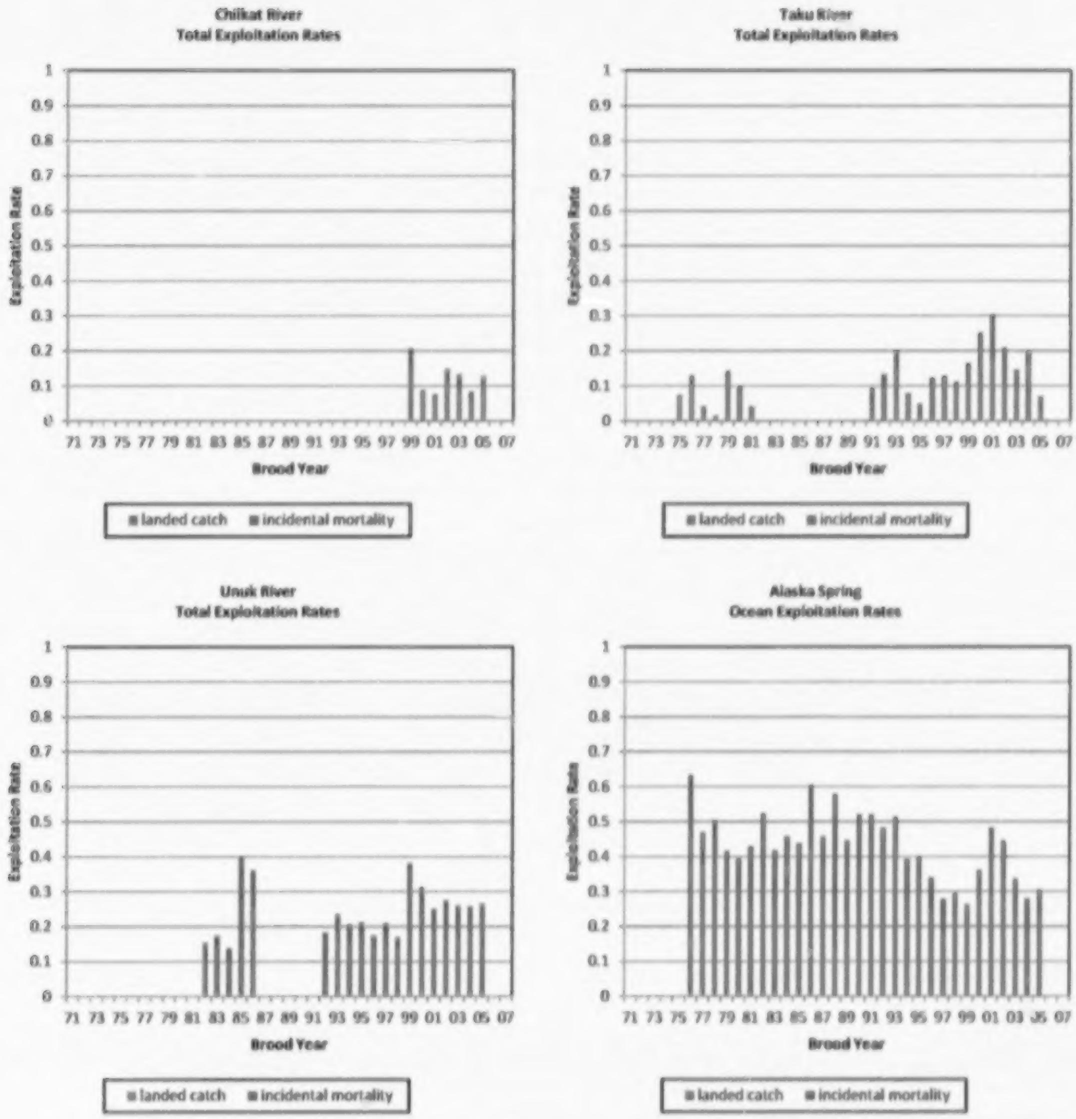


Figure 2.2 Brood year exploitation rate for SEAK stocks. Catch and incidental mortality are shown. Only completed brood years are included.

Table 2.6 Summary of statistics generated by the 2012 CWT cohort analysis for SEAK indicator stocks. Statistics include total mortality (catch plus incidental mortality) brood year exploitation rate (BYER), cohort survival rate to age 3, and calendar year (CY) percent distribution of the total mortality in the escapement for Agreement periods 1999–2008 and 2009–present.

						CY % Escapement[1]		
		BYER (total mortality)		Survival rate		1999–2008	2009–present	
Stock	Indicator Stock Name	Mean (range)	Last complete BY	Mean (range)	Last complete BY	Mean (range)	Mean (range)	Last CY (if ≠ current)
AKS	Alaska Spring[2]	43% (26–63%)	31%	8.88% (2.15–25.54%)	6.11% (2005)	49% (33–62%)	57% (56–59%)	57%
CHK	Chilkat River	12% (8–21%)	13%	11.55% (1.60–29.86%)	19.27% (2007)	86% (80–93%)	85% (77–95%)	83%
TAK	Taku River	13% (2–30%)	7%	9.75% (2.91–26.41%)	5.43% (2005)	84% (61–94%)	85% (78–94%)	83%
UNU	Unuk River	24% (14–40%)	27%	5.81% (2.04–13.28%)	4.14% (2005)	76% (62–85%)	74% (71–78%)	73%

[1] % Escapement is not a measure of performance for the escapement indicator stock(s) associated with a given CWT indicator stock. See CTC (2013) for these details.
[2] BYER is ocean exploitation rate only.

2.2.1.2 *Survival Rates*

The survival rate of all SEAK stocks is computed as the survival to age 3 because the fish enter the ocean as yearlings. The Chilkat River survival rates range from around 2–6% and the survival rate was 5% for the last complete BY. The Taku River can have extremely good survival rates (>25%), but has been below the long-term average (3–8%) for the most recent five complete BYs. The survival rate on the Unuk River has historically been above 10%, but has been below average at 2–4% for the most recent five complete BYs. The observed survival for the AKS stock has ranged from 26% for BY 1976 to 2% for BY 1977 with an average survival of 9%. The most recent five complete BYs for AKS have an average survival rate of 8%, with the last complete BY (2005) having a survival rate of 6% (Figure 2.3; Table 2.6).The AKS survival rate index for the most recent two BYs is lower than 1.0, indicating that survival is below the long-term average (Figure 2.4; Table 2.6).

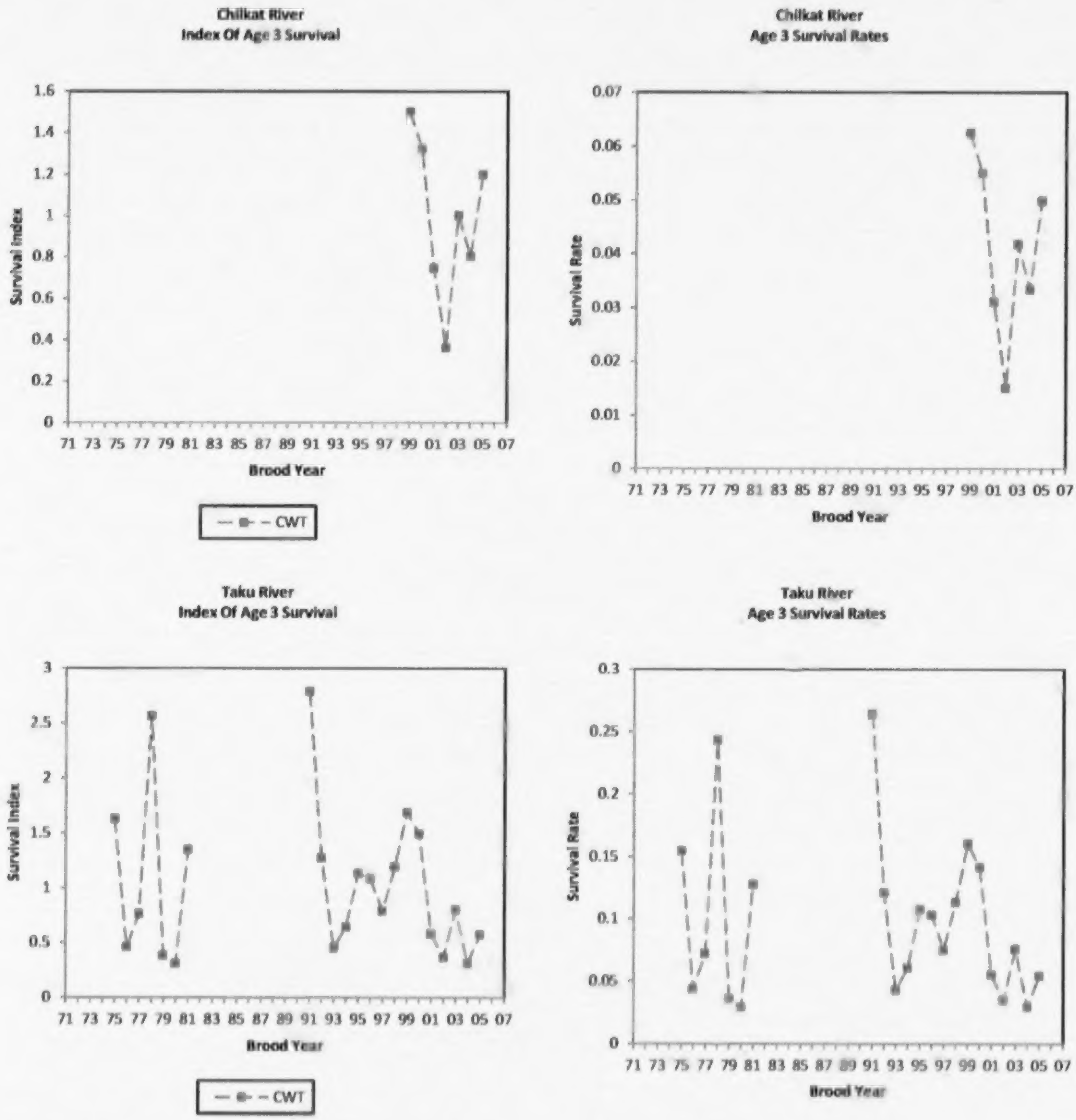


Figure 2.3 CWT survival and EV indices and survival rate for Chilkat and Taku stocks.

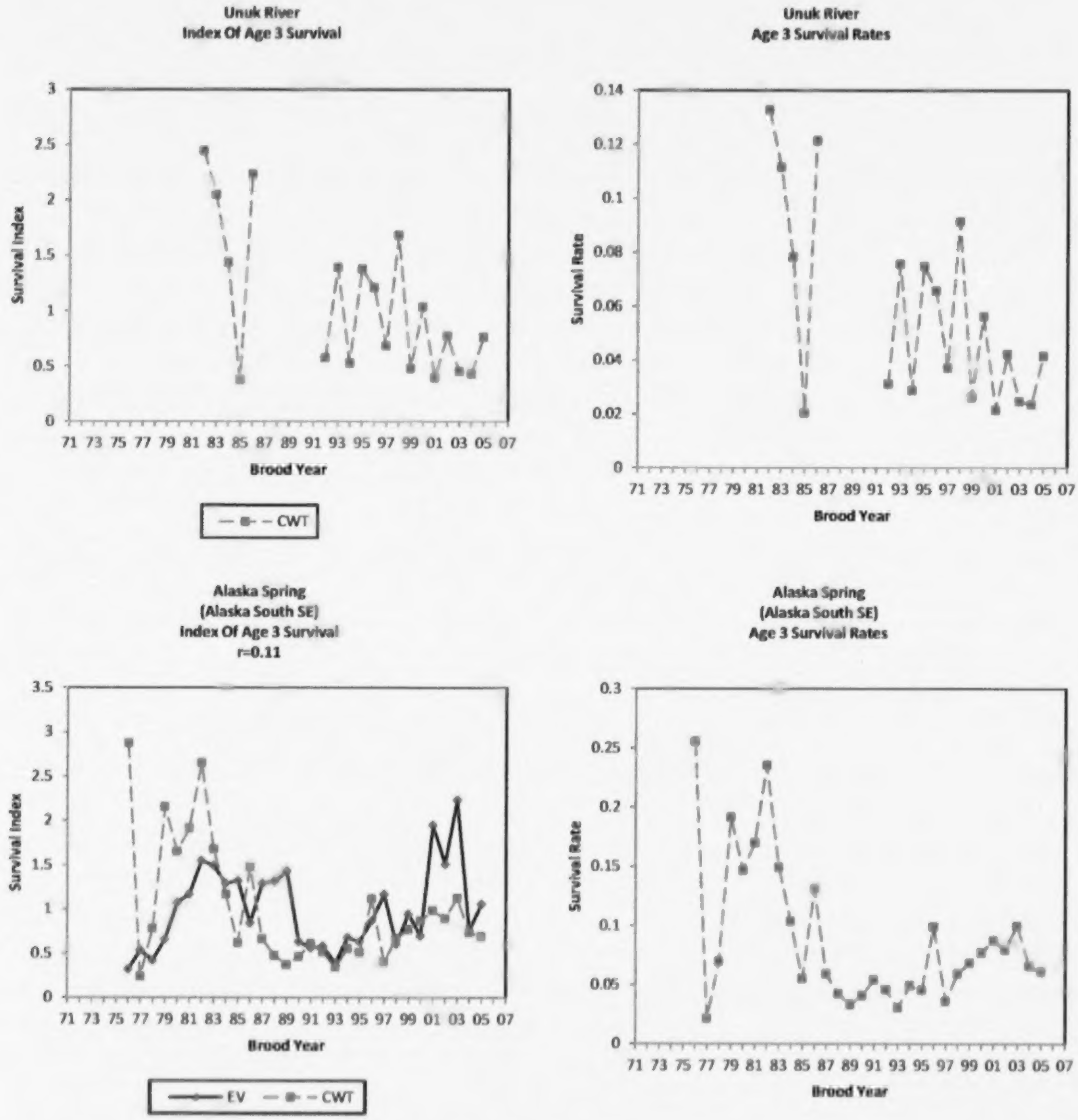


Figure 2.4 *CWT survival and EV indices and survival rate for Unuk and Alaska Spring stocks. r: Pearson correlation coefficient between CWT and EV survival indices.*

2.2.1.3 *Mortality Distributions*

A high percentage of CHK mortalities (average of 86%; Figure 2.5; Table 2.6; Appendix C4), TAK mortalities (1999–2011 average of 84%; Figure 2.5; Appendix C42) and UNU mortalities (1999–2011 average of 75%; Figure 2.5; Table 2.6; Appendix C43) occur after fisheries (i.e., within the escapement), with the remaining mortalities caught in the SEAK AABM sport, troll, and net fisheries. Of the SEAK AABM fisheries, the SEAK net fishery catches a higher percentage of CHK fish (average of 7%) and TAK fish (1999–2011 average of 9%) while the SEAK troll fishery catches a higher percentage of UNU fish (1999–2011 average of 13%). A few UNU mortalities have occurred in the Canadian net fishery in some years. Approximately 51% of AKS mortalities occur on at hatcheries for the 1999–2011 time period, with the remaining mortalities occurring in the SEAK AABM fisheries and the SEAK terminal net and terminal sport fisheries. The SEAK AABM troll fishery accounts for an average of 21% of the AKS total mortalities for the 1999–2011 time period, while the SEAK AABM sport and terminal sport account for an average of 9% (sport) and 11% (terminal sport) of the mortalities (Figure 2.5; Table 2.6; Appendix C1).

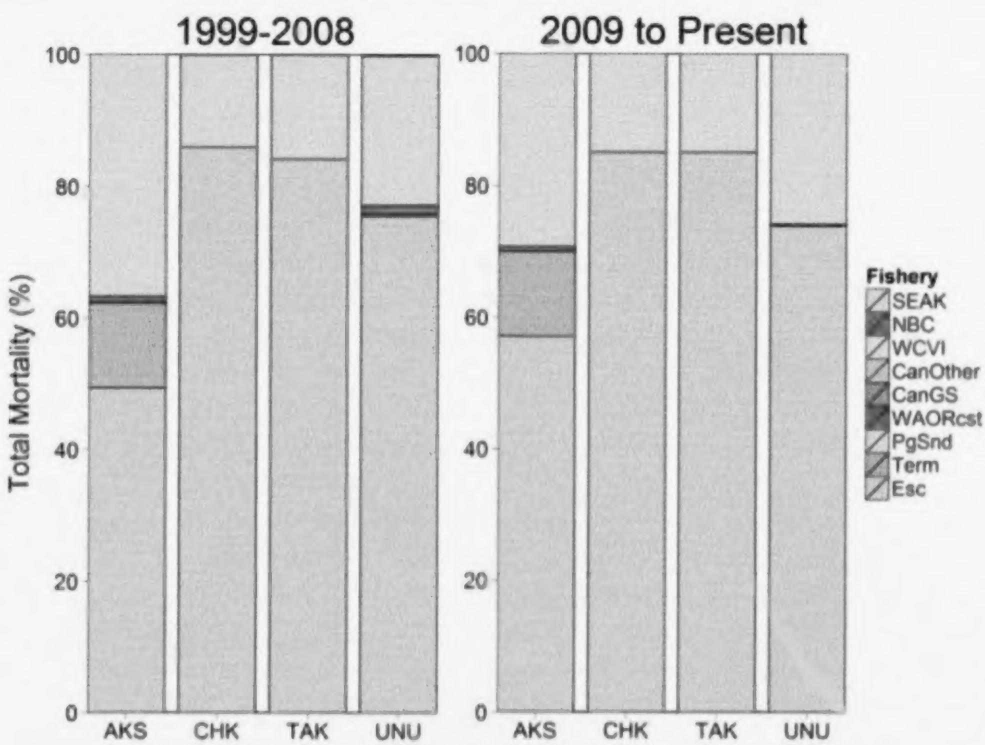


Figure 2.5 Distribution of total mortality for SEAK indicator stocks for the current (2009–present) and previous (1999–2008) agreement periods.

2.2.2 North and Central British Columbia Stocks

There are two hatchery CWT indicator stocks for North/Central B.C., Kitsumkalum and Atnarko. Atnarko (ATN) is composed of tag recoveries from the Snootli Hatchery and is not currently used to represent a Chinook Model stock. The Kitsumkalum hatchery indicator stock (KLM) is composed of tag recoveries from the Deep Creek hatchery, and it is used to represent the North/Central B.C. model stock NTH. Kitsumkalum Chinook enter the ocean as yearlings and age 3 is the youngest age at which CWTs are recovered, whereas Atnarko Chinook enter the ocean as subyearlings and age 2 is the youngest age recovered. The KLM time series begins in BY 1979, while the ATN time series begins in BY 1986. There were no KLM CWT releases in 1982, and no ATN CWT releases in 2003 and 2004.

2.2.2.1 *Brood Year Exploitation Rates*

The BYERs computed for KLM and ATN include recoveries from ocean fisheries and terminal fisheries. While the BYER for KLM has been generally decreasing from levels greater than 60% in 1979–1980 to approximately 31% in 2006, the BYER for ATN has been generally increasing from approximately 32% in 1986 to approximately 56% in 2006 (Figure 2.6). KLM BYER averaged 42% and ranged from 23% for BY 2004 to 67% for BY 1979, whereas ATN BYER averaged 41% and ranged from 30% for BY 1990 to 59% for BY 2000. Incidental mortalities have tended to make up an increasing proportion of the KLM BYER, averaging 19% of the total mortality with a range of 11–28%. In the case of ATN, the percentage of the BYER that is IM shows no tendency, averaging 11.5% with a range of 7–16%.

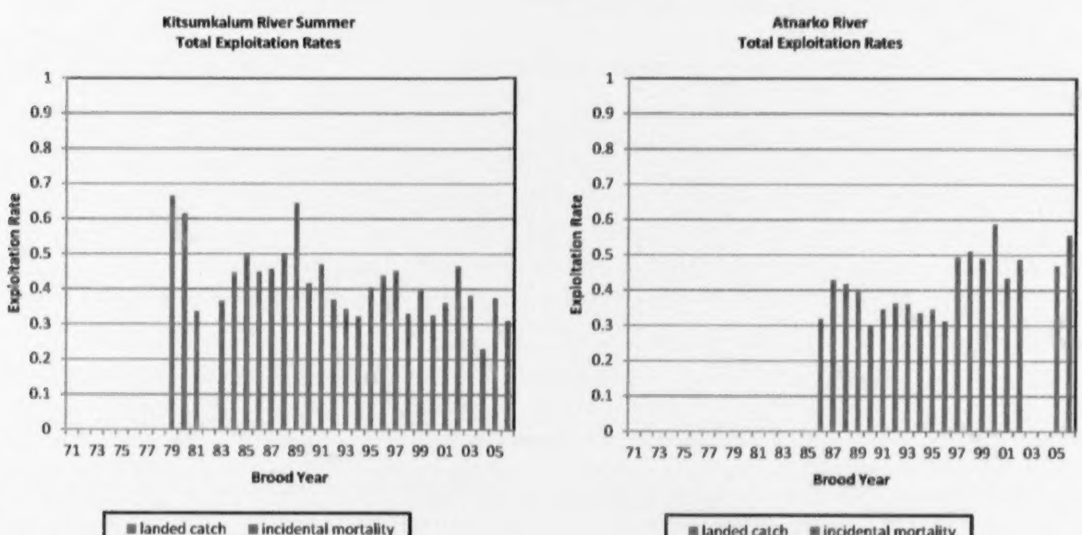


Figure 2.6 Total brood year exploitation rate for North and Central B.C. stocks. Catch and incidental mortality are shown. Only completed brood years are included.

2.2.2.2 *Survival Rates*

The survival rate of KLM is survival to age 3 because the fish enter the ocean as yearlings while the survival rate of ATN is survival to age 2 because the fish enter the ocean as subyearlings. The KLM survival rates have averaged 1.0% and ranged from around 0.1–2.4% with a survival rate of 1.1% for the last complete BY. In the case of ATN, survival rates have averaged 2.3% and ranged from around 0.5–4.9% with a survival rate of 1% for the last complete BY (Figure 2.7). The EV index and the survival index are poorly correlated in both KLM and ATN with r = 0.13 (KLM) and r = 0.40 (ATN).

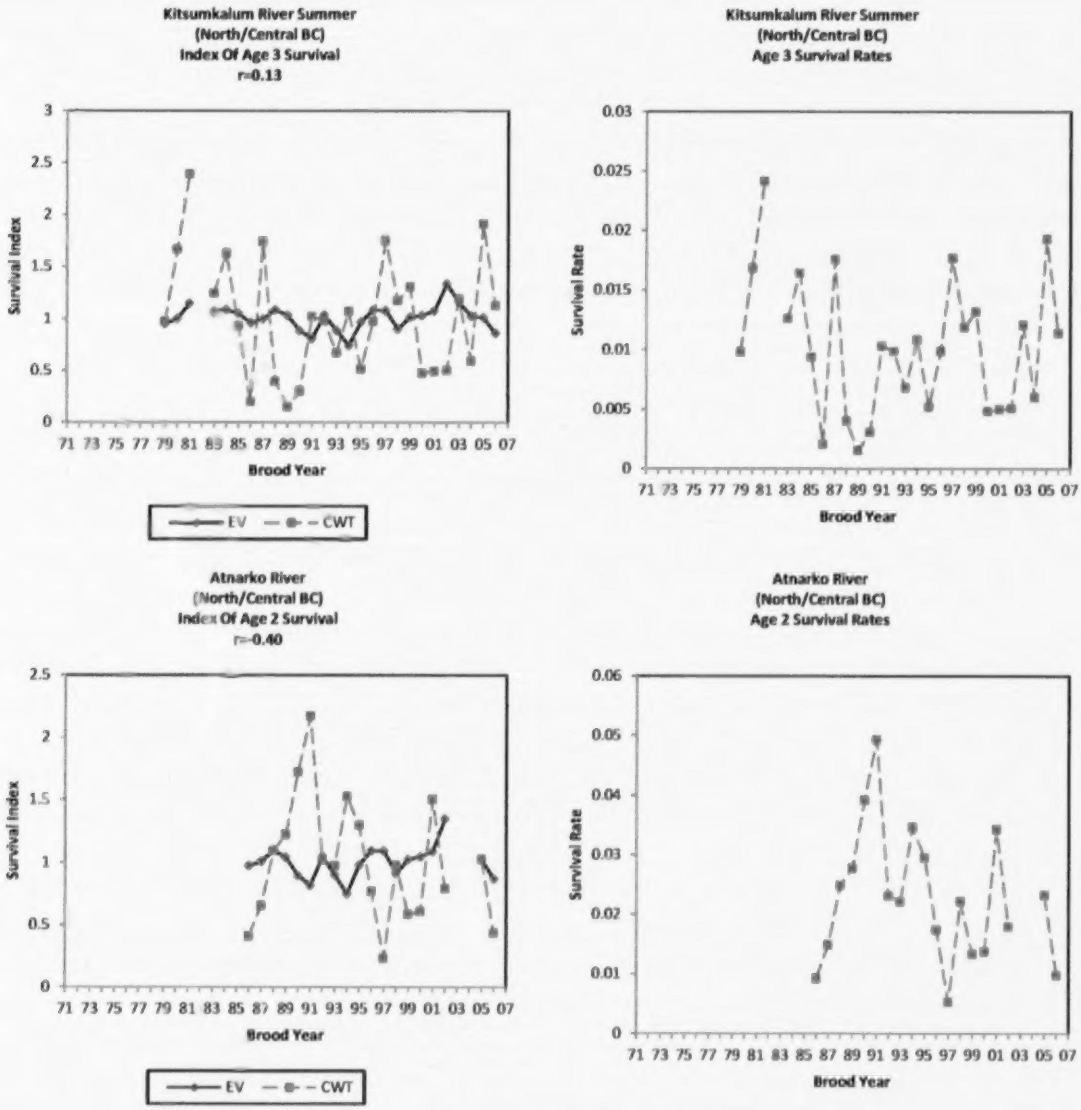


Figure 2.7 CWT survival and EV indices and survival rate for North and Central B.C. stocks. r: Pearson correlation coefficient between CWT and EV survival indices.

2.2.2.3 *Mortality Distributions*

An average of 56% of the KLM total mortality (Figure 2.8; Appendix C15) and 58% of the ATN mortality (Figure 2.8; Appendix C2) occurred in the escapement during the entire mortality distribution time series, which begins in 1984 for KLM and 1990 for ATN. The average mortality in the escapement increases to 61% in KLM and slightly decreases to 56% in ATN during 1999–2012. Most of the remaining mortalities in KLM are associated to catch and IM in the SEAK AABM troll (1999–2012 average: 12%) and the NBC AABM sport (1999–2012 average: 10%) fisheries. NBC AABM troll and ISBM Canada net fisheries used to be important mortality components for KLM during 1979–1984 with 19% (AABM troll) and 24% (ISBM Canada) of the total mortality but their relevance diminishes to approximately 2% (AABM troll) and 6%, (ISBM Canada) during 1999–2012. In the case of ATN, most of the fishing mortality is associated to catch and IM in the SEAK AABM troll (1999–2012 average: 9%), the NBC AABM sport (1999–2012 average: 8%), and the ISBM terminal net fisheries (1999–2012 average: 18%). ISBM Canada net fisheries used to be important mortality components for ATN during 1985–1998 with 13–17% of the total mortality but their relevance diminishes to approximately 3% during 1999–2012.

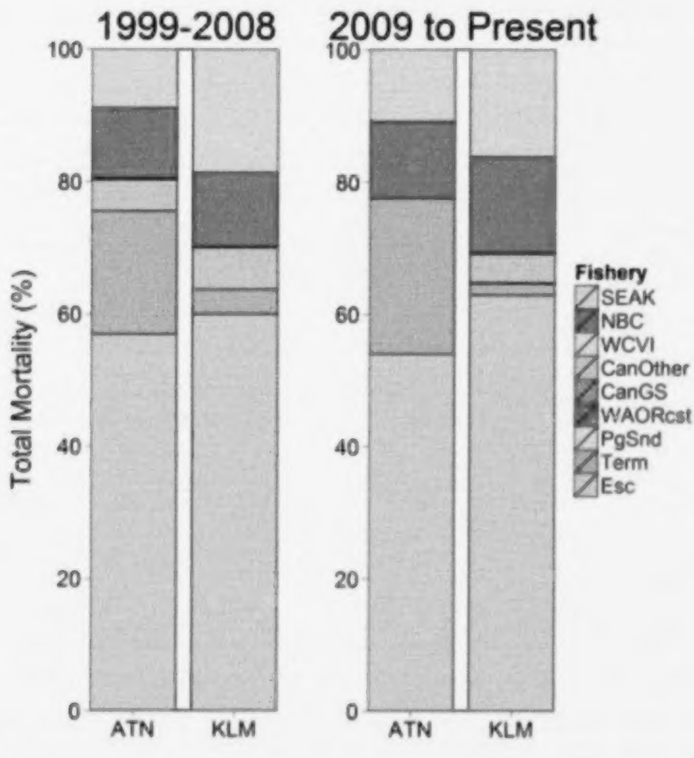


Figure 2.8 Distribution of total mortality for North and Central B.C. indicator stocks for the current (2009–present) and previous (1999–2008) agreement periods.

2.2.3 West Coast Vancouver Island Stocks

There is one hatchery CWT indicator stock to represent wild and hatchery WCVI Chinook: Robertson Creek Fall. The Robertson Creek Fall indicator stock (RBT) is composed of tag recoveries from the Robertson Creek hatchery, and it is used to represent the WCVI model stocks RBH (hatchery) and RBT (natural). WCVI Chinook enter the ocean as subyearlings and age 2 is the youngest age recovered. The RBT time series begins in BY 1973 and the latest complete BY is 2007.

2.2.3.1 *Brood Year Exploitation Rates*

The BYER computed for RBT includes only recoveries from ocean fisheries. The BYER for RBT has been decreasing from approximately 77% for BY 1973 to approximately 37% for BY 2007 (Figure 2.9). Not including BY 1992, which was characterized by zero recoveries in the catch as a result of the poorest survival to age 2 observed for this stock (see next section), BYER for RBT averaged 45% and ranged from 25% for BY 1998 to 77% for BY 1973. The 17% IM experienced by BY 1992 is entirely attributed to CWT recoveries of sublegal fish. The percentage of the RBT BYER that is IM increased exponentially during the first 10 years of the time series from approximately 14% for BY 1973 to 68% for BY 1983. It then decreased substantially to approximately 20%, then increased exponentially again for the following eight BYs to approximately 59% for BY 1991. The variation in the percentage of the RBT BYER that is IM subsided after BY 1992. The percentage of the RBT BYER that is IM averages approximately 26% for the entire time series.

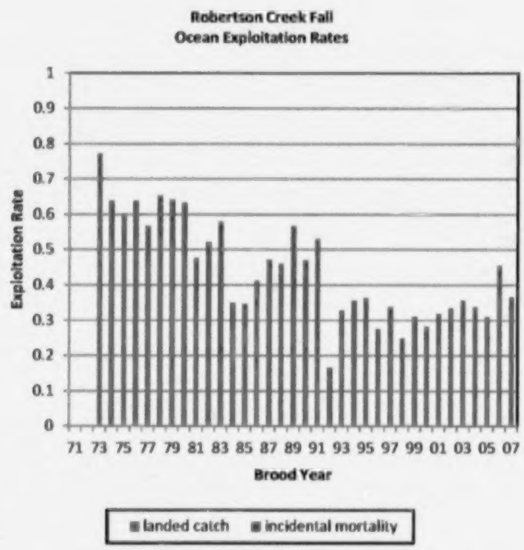


Figure 2.9 Brood year ocean exploitation rates for Robertson Creek Fall. Catch and incidental mortality are shown. Only completed brood years are included.

2.2.3.2 *Survival Rates*

The survival rate of RBT is survival to age 2 because the fish enter the ocean as subyearlings. The RBT survival rates show a general declining trend, averaging 5.0% and ranging from around 0.01% for BY 1992 to 21.1% for BY 1974, with a survival rate of 4.4% for the last complete BY (Figure 2.10). In addition to BY 1992, BYs 1983, 1995, 1996, and 1997 have also experienced extremely low survival rates. The EV index and the survival index are moderately correlated with r = 0.66.

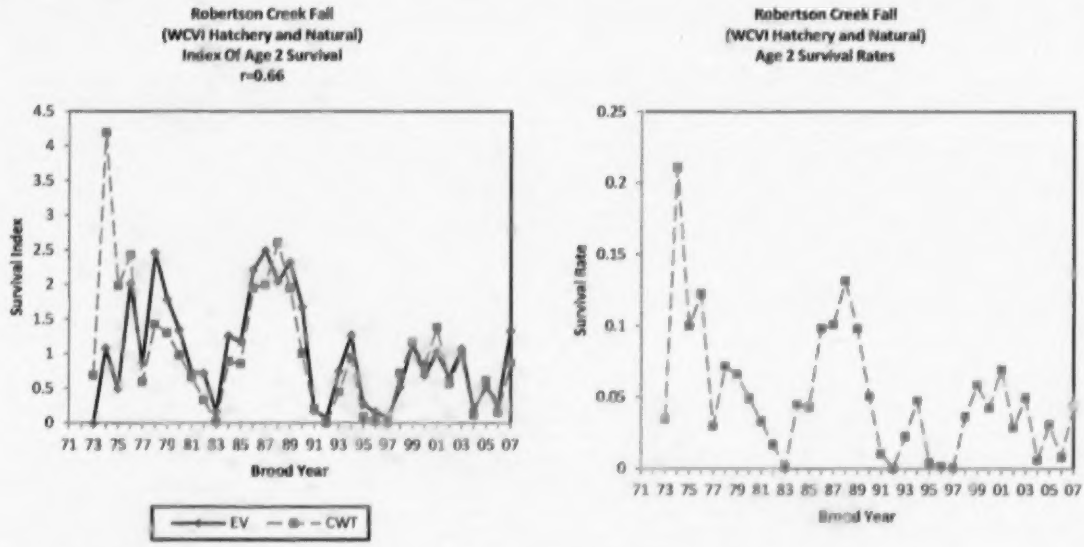


Figure 2.10 CWT survival and EV indices and survival rate for Robertson Creek Fall. r: Pearson correlation coefficient between CWT and EV survival indices.

2.2.3.3 *Mortality Distributions*

An average of 36% of the RBT total mortality (Figure 2.11; Appendix C28) occurred in the escapement during 1979–2012. The RBT average mortality in the escapement increased to 44% during 1999–2012. Most of the remaining mortalities in this stock are associated to catch and IM in the SEAK AABM troll (1999–2012 average: 12%), ISBM terminal net (1999–2012 average: 12%) and sport (1999–2012 average: 11%) fisheries. The NBC AABM troll fishery used to be an important mortality component for RBT during 1979–1995, with 9–12% of the total mortality, but its relevance diminished to approximately 3% during 1999–2012. The ISBM Canada net fishery was also an important RBT mortality component during 1979–1984 with around 6% of the total mortality, but its contribution effectively became 0% during 1999–2012.

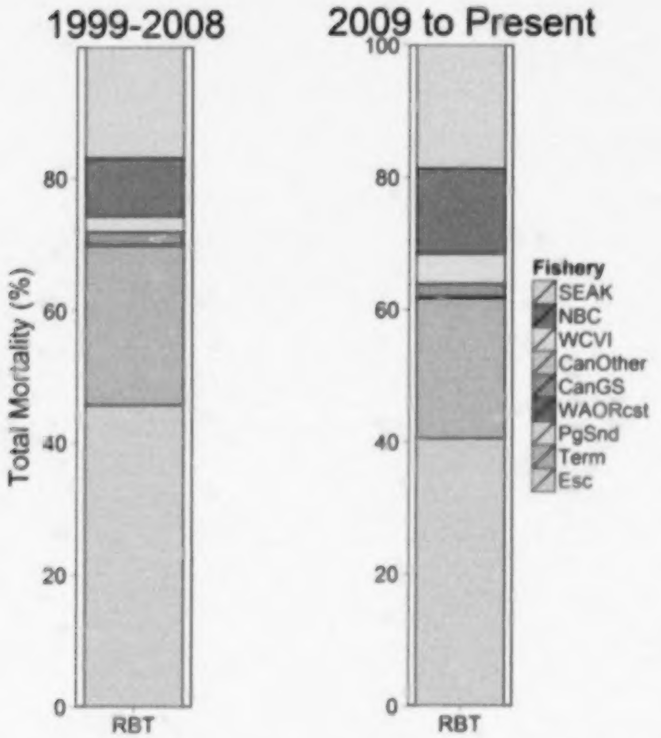


Figure 2.11 Distribution of total mortality for the WCVI indicator stock (Robertson) for the current (2009–present) and previous (1999–2008) agreement periods.

2.2.4 Strait of Georgia Stocks

Strait of Georgia model stocks are segregated into upper Strait of Georgia (GSQ) and lower Strait of Georgia (GST for wild Chinook and GSH for hatchery Chinook). There is one hatchery CWT indicator stock for upper Strait of Georgia (Quinsam [QUI]), two for lower Strait of Georgia Natural (Cowichan [COW] and Nanaimo [NAN]), and two for lower Strait of Georgia Hatchery (Puntledge [PPS] and Big Qualicum [BQR]). QUI is composed of tag recoveries from the Quinsam Hatchery. COW and NAN are composed of tag recoveries from the Cowichan and Nanaimo hatcheries while PPS and BQR are composed of tag recoveries from the Puntledge and Big Qualicum hatcheries. Strait of Georgia Chinook enter the ocean as subyearlings and age 2 is the youngest age at which CWTs are recovered. The QUI time series begins in BY 1974, COW in 1985, NAN in 1979, PPS in 1975, and BQR in 1973. NAN time series not only starts later than the other Strait of Georgia stocks but also exhibits several gaps.

2.2.4.1 *Brood Year Exploitation Rates*

The BYERs computed for Strait of Georgia stocks include recoveries from ocean fisheries and terminal fisheries. There is a general declining tendency for BYERs of the indicator stock for upper Strait of Georgia (Figure 2.12) as well as for most of the indicator stocks for lower Strait of Georgia (Figure 2.13). The BYER for QUI has decreased from approximately 71% in 1974 to approximately 37% in 2006, averaging 58% and ranging from 31% for BY 2004 to 84% for BY

1977 (Figure 2.12). The percentage of the QUI BYER that is IM increased consistently during the first 17 years of the time series reaching 57% for BY 1991, and then decreasing substantially to average levels for subsequent BYs. Similar exploitation rate patterns occurred for all lower Strait of Georgia indicator stocks, except for COW (Figure 2.13) for which BYERs generally decreased from BY 1985 to BY 1995, and generally increased in subsequent BYs. COW BYER averaged approximately 70% and ranged from 37% for BY 1995 to 89% for BY 1985. The percentage of the COW BYER that is IM increased consistently during the first 11 years of the time series reaching 47% for BY 1995, and averaged approximately 33% for the entire time series. BYERs of the other three lower Strait of Georgia indicator stocks, BQR, NAN, and PPS, decreased from exploitation rate levels of 80–90% to exploitation rate levels of 25–35%. The lowest BYERs for these stocks were experienced by BY 2007 in BQR (33%), by BY 2001 in NAN (36%), and by BY 1998 in PPS (12%). The percentage of the BYER that is IM in these three stocks increased consistently during the first 15–20 years of the time series and averaged 23% in BQR, 33% in NAN, and 25% in PPS.

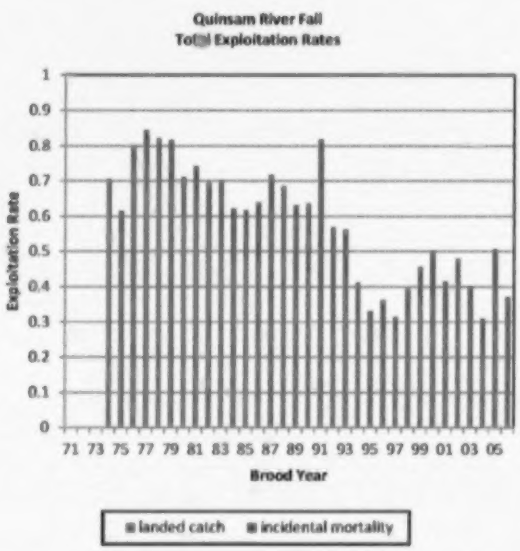


Figure 2.12 Total brood year exploitation rate for Quinsam River Fall. Catch and IM are shown. Only completed brood years are included.

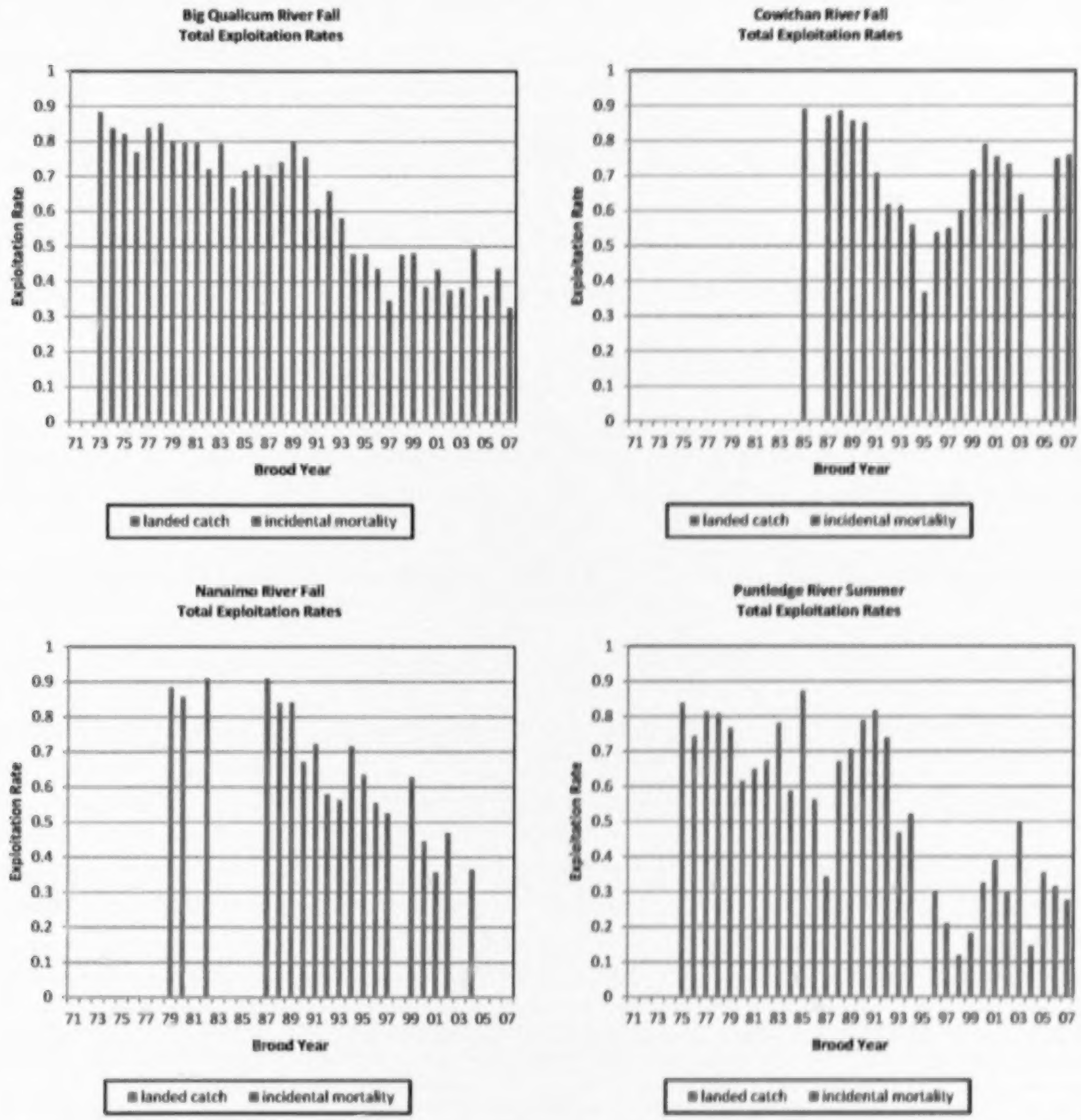


Figure 2.13 Total brood year exploitation rate for Lower Strait of Georgia stocks. Catch and incidental mortality are shown. Only completed brood years are included.

2.2.4.2 *Survival Rates*

The survival rates of Strait of Georgia CWT indicator stocks represent survival to age 2 because fish enter the ocean as subyearlings. All these stocks show a clear declining trend in survival rates and moderate correlations between survival and EV indices, except for NAN with a correlation coefficient of 0.39. The QUI survival rates have averaged 2.3% and ranged from around 0.2% for BY 2006 to 9.3% for BY 1976 (Figure 2.14). In the case of lower Strait of Georgia CWT indicator stocks, BQR survival rates have averaged 2.7% with a range of approximately 0.1–25.6% (the highest observed for Strait of Georgia stocks), COW survival rates have averaged 2.0% with a range of approximately 0.3–7.0%, NAN survival rates have averaged 2.2% with a range of approximately 0.6–5.8%, and PPS survival rates have averaged 1.2% with a range of approximately 0.1–12.4% (Figure 2.15). The survival rate for the last completed brood of the time series was 0.2% for QUI, 0.5% for BQR, 0.7% for COW, 3.0% for NAN, and 0.8% for PPS.

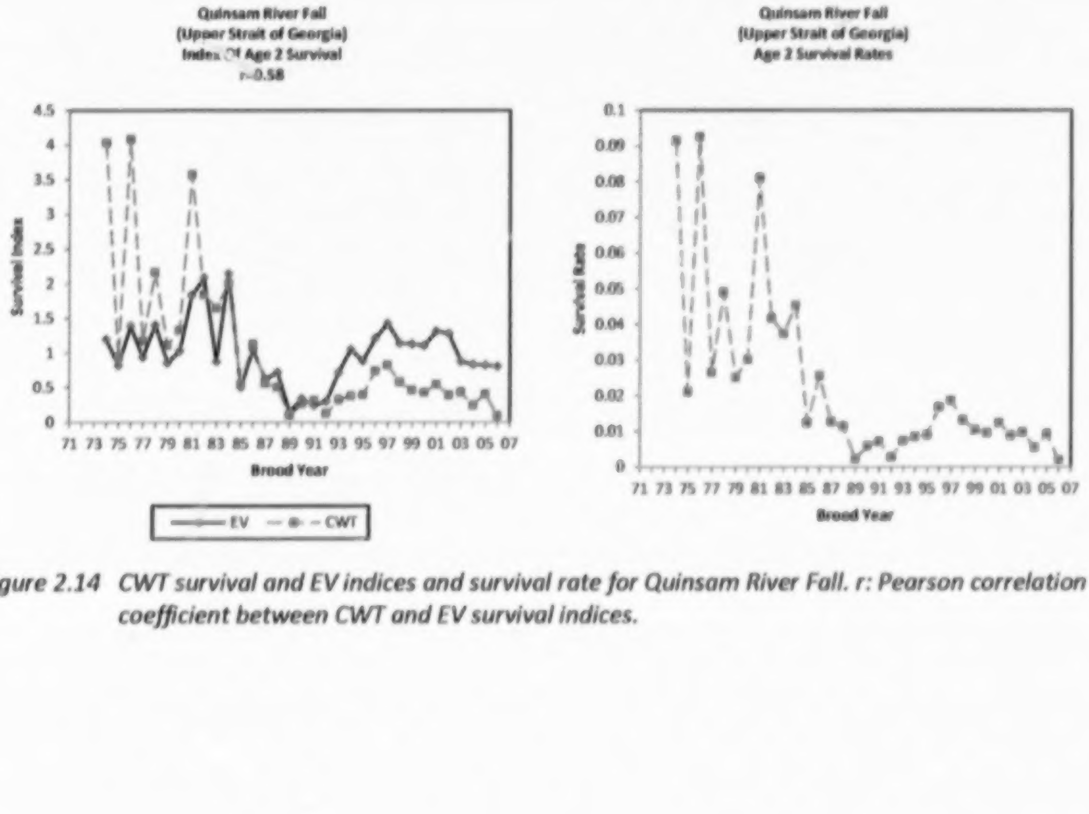


Figure 2.14 CWT survival and EV indices and survival rate for Quinsam River Fall. r: Pearson correlation coefficient between CWT and EV survival indices.

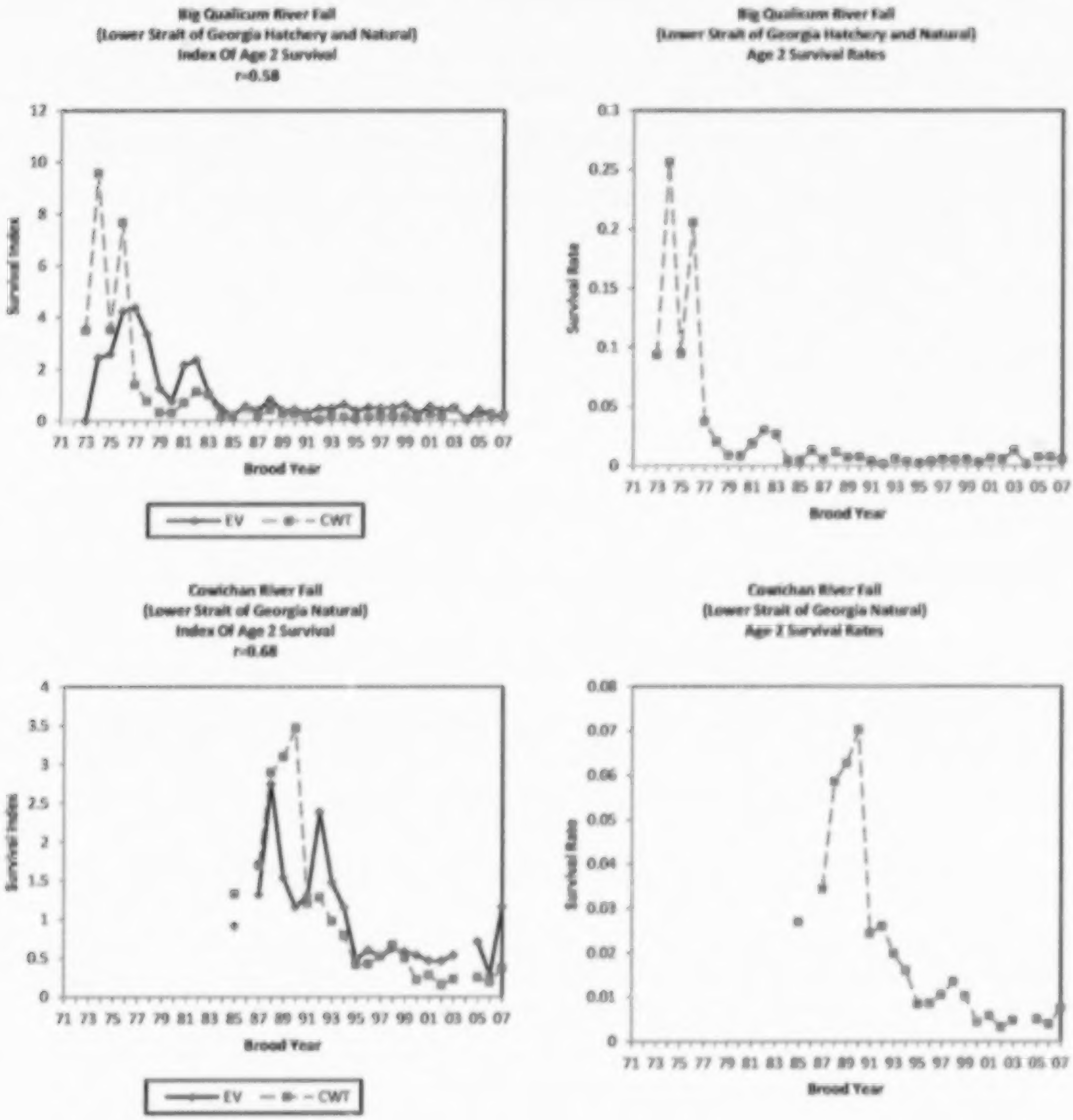


Figure 2.15 CWT survival and EV indices and survival rate for Lower Strait of Georgia stocks. r: Pearson correlation coefficient between CWT and EV survival indices.

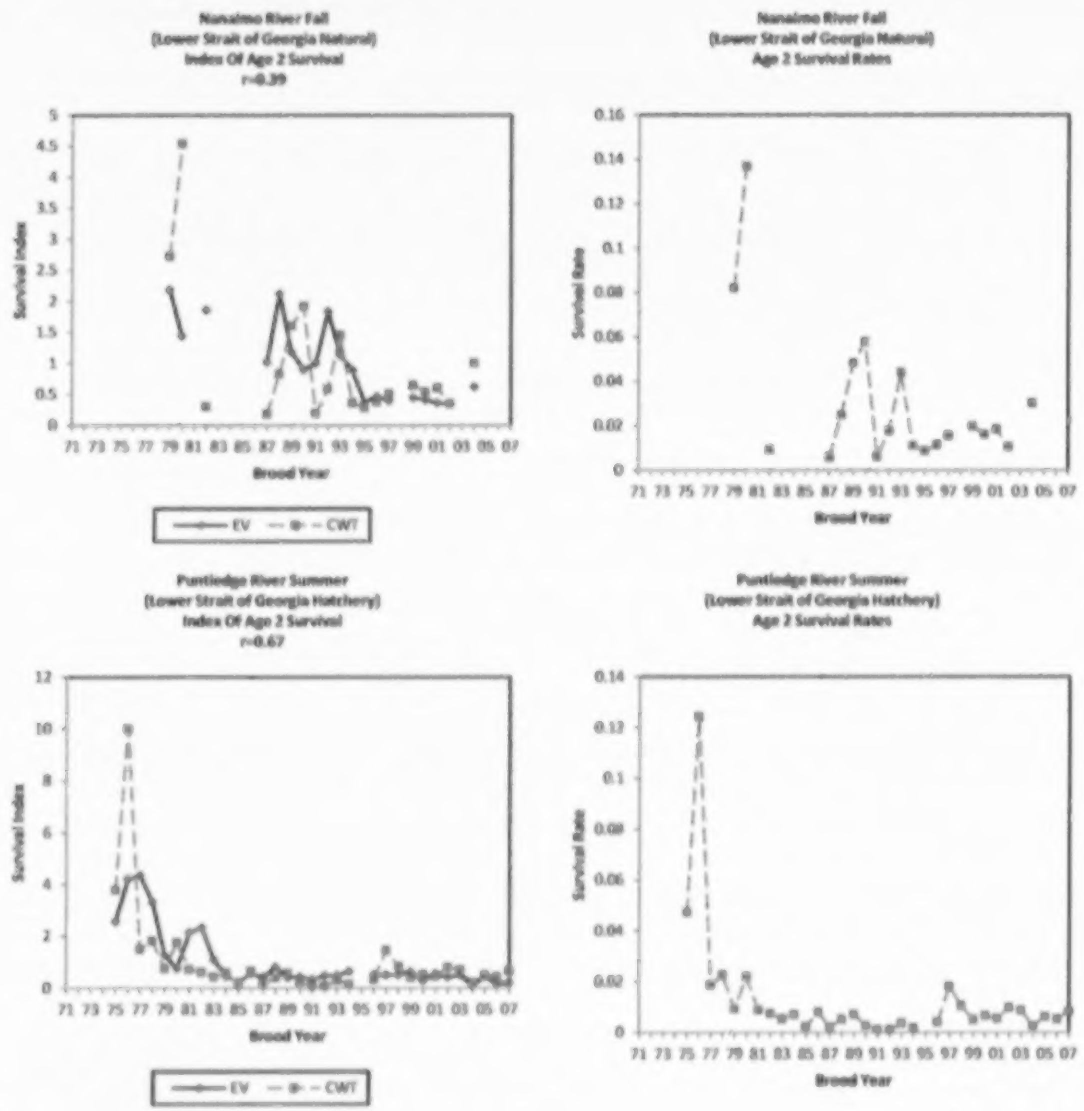


Figure 2.15 Page 2 of 2.

2.2.4.3 *Mortality Distributions*

Total mortality in the upper Strait of Georgia indicator stock QUI (Figure 2.16; Appendix C26) averaged 44% in the escapement during 1979–2012, and increased to 59% during 1999–2012. Most of the remaining mortalities in this stock are associated to catch and IM in the SEAK AABM troll (1999–2012 average: 14%) and NBC AABM sport (1999–2012 average: 14%) fisheries. The NBC AABM troll and ISBM Canada troll and net fisheries used to be important mortality components for QUI during 1979–1995 with 7–10% of the total mortality in NBC AABM troll, 5–10% in ISBM Canada troll, and 16–22% in ISBM Canada sport. Average Chinook mortality in these fisheries diminishes during 1999–2012 to approximately 1% for NBC AABM

troll, 0% for the ISBM Canada troll, and 1% for the ISBM Canada sport. The ISBM Strait of Georgia sport fishery was a particularly important QUI mortality component during 1996-1998 with around 9% of the total mortality but its contribution has diminishes to 4% during 1999–2012.

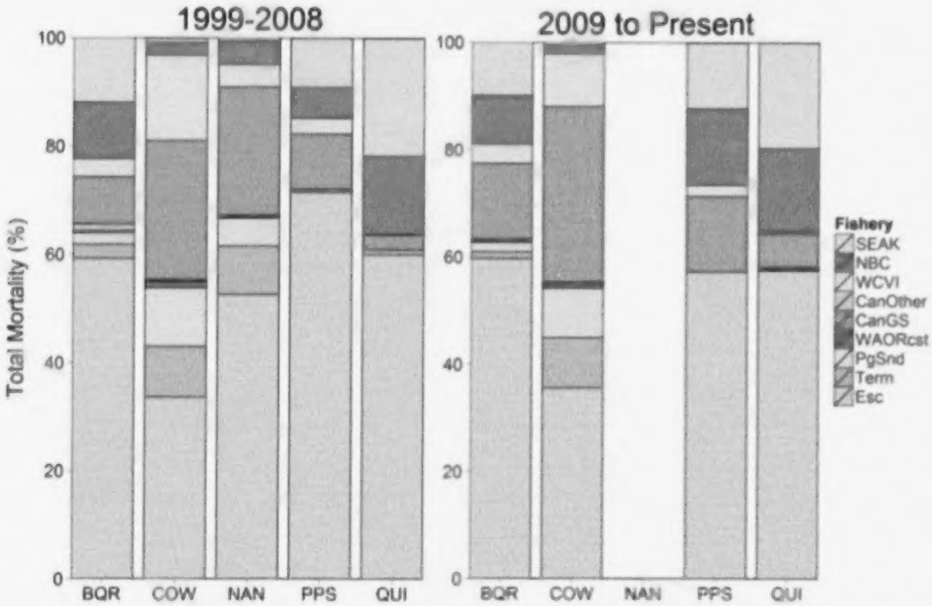


Figure 2.16 Distribution of total mortality for upper and lower Strait of Georgia indicator stocks for the current (2009–present) and previous (1999–2008) agreement periods.

Among the lower Strait of Georgia indicator stocks, an average of 42% of the BQR total mortality (Figure 2.16; Appendix C3), 32% of the COW total mortality (Figure 2.16; Appendix C6), 41% of the NAN total mortality (Figure 2.16; Appendix C20), and 50% of the PPS total mortality (Figure 2.16; Appendix C25) occurred in the escapement during 1979–2012 (note that COW mortality distribution time series begins in 1990 and that of NAN is truncated to 1984–2006). During 1999-2012, the average mortality in the escapement increases to 59% in BQR, to 34% in COW, to 53% in NAN, and 67% in PPS. Most of the remaining mortalities in BQR are associated to catch and IM in the ISBM Strait of Georgia sport (1999–2012 average: 10%), the SEAK AABM troll (1999–2012 average: 8%), and the NBC AABM sport (1999–2012 average: 8%) fisheries. The ISBM Canada net and troll fisheries used to be important mortality components for BQR during 1979–1995 with 10–15% (net) and 3–8% (troll) of the total mortality but their relevance diminishes to less than 1% during 1999–2012. The ISBM Strait of Georgia troll fishery was also important during 1979–1984, averaging 15% of the BQR total mortality, but its contribution becomes effectively 0% during 1999–2012. In the case of COW, total fishing mortality is dominated by the ISBM Strait of Georgia sport fishery (1999–2012 average: 28%), but the WCVI AABM troll (1999–2012 average: 9%), the ISBM Puget Sound net (1999–2012 average: 7%), and the ISBM terminal net (1999–2012 average: 7%) fisheries are also important COW mortality components. The ISBM Strait of Georgia troll fishery used to be an important

mortality component for COW during 1985–1995, averaging 9% of the total mortality, but its contribution becomes effectively 0% during 1999–2012. Similar to COW, most of NAN fishing mortality has been dominated by the ISBM Strait of Georgia sport fishery (1984–2006 average: 34%). ISBM Canada net and troll fisheries were important mortality components for NAN in the past with 19% (net) and 13% (troll) of the total mortality in 1984, but their relevance diminished to mortality levels of 0% (net) and 3% (troll) during 1999–2006. Lastly, most of PPS fishing mortality is associated to catch and IM in the ISBM Strait of Georgia sport (1999–2012 average: 11%), the NBC AABM sport (1999–2012 average: 8%), and the SEAK AABM troll (1999–2012 average: 8%) fisheries. ISBM Strait of Georgia troll and ISBM Canada troll and net fisheries used to be important mortality components for PPS during 1979–1984 with 14% of the total mortality associated to ISBM Strait of Georgia troll, 10% to ISBM Canada troll, and 11% to ISBM Canada net. During 1999–2012, their relevance diminished to mortality levels of 0% for both the ISBM Strait of Georgia troll and the ISBM Canada troll fisheries, and less than 1% for ISBM Canada net fisheries.

2.2.5 Fraser Stocks

Fraser River Chinook have been represented by two model stocks, Fraser Early (FRE), and Fraser Late (FRL). The CWT indicator stocks for Fraser Early represent different combinations of run type and life history. There are two hatchery CWT indicator stocks for Fraser Late (Chilliwack [CHI] and Harrison [HAR]), two for Fraser Early Spring-run type (Nicola [NIC; age 1.2] and Dome [DOM; age 1.3]), and one for Fraser Early subyearling Summer-run type (Lower Shuswap [SHU; age 0.3]). There is no CWT indicator for Fraser Early yearling Summer-run type, and DOM was discontinued after the 2002 BY. CHI is composed of tag recoveries of the Chilliwack River fall stock released from the Chilliwack Hatchery whereas HAR is composed of tag recoveries of the Harrison River stock released from the Chehalis Hatchery. NIC is composed of tag recoveries of the Nicola River stock released from the Spius Creek hatchery and DOM is comprised of releases of Dome Creek stock from the Penny Hatchery. SHU is composed of tag recoveries of Lower Shuswap River Chinook from the Shuswap Falls Hatchery. Fraser Late (Fall) enter the ocean as subyearlings and age 2 is the youngest age at which CWTs are recovered. Fraser Early includes stocks that enter the ocean as subyearlings and stocks that enter the ocean as yearlings. The SHU stock are Summer Chinook, entering the ocean as subyearlings, whereas the NIC and DOM stocks are Spring Chinook, entering the ocean as yearlings with age 3 as the youngest age at which CWTs are recovered. The time series of recoveries for Fraser Late stocks CHI and HAR starts with BY 1981, the time series of DOM begins with BY 1986, NIC with BY 1985, and SHU with BY 1984. Unlike the other Fraser River stocks with time series ending with BY 2007, the last completed BY for DOM is 2002.

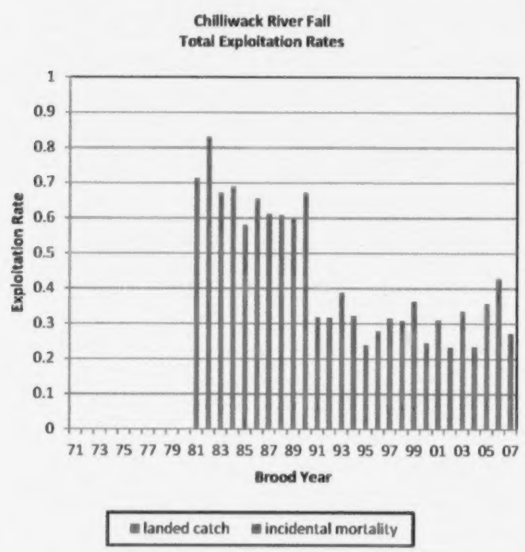
2.2.5.1 *Brood Year Exploitation Rates*

The BYERs computed for Fraser River stocks include recoveries from ocean fisheries and terminal fisheries within the Fraser River and tributaries. BYERs for the Fraser Late indicator stocks have a declining tendency over their time series (Figure 2.17). In the Fraser Early indicator stocks, BYER was increasing for DOM when that program was discontinued (last completed BY 2002); however, no clear trend is apparent for NIC and SHU (Figure 2.18). Between BY 1981 and BY 2007, the BYERs decreased from approximately 71% to 27% for CHI

and from approximately 86% to 21% for HAR. CHI BYER averaged 44% and ranged from 23% for BY 2002 to 83% for BY 1982, whereas HAR BYERs averaged 53% and ranged from 21% for BY 1995 to 91% for BY 1982.

Within BYERs, the percentage of the BYER represented by IM for CHI averaged 22% and increased consistently during the first 15 years of the time series, reaching 36% for BY 1995, and then decreased substantially to average levels for subsequent BYs. Similarly, the percentage of the HAR BYER that results from IM also averaged 22% and increased consistently during the first 15 years of the time series, reaching 41% for BY 1995, and then decreased substantially to average levels for subsequent BYs.

Exploitation rate patterns differed for the three indicator stocks representing Fraser Early. DOM BYER averaged approximately 57% and ranged from 16% for BY 1986 to 80% for BY 1996. The percentage of the DOM BYER that is attributed to IM remained relatively stable, averaging approximately 15% for the entire time series, and reached its lowest values for BYs 1988 (4%) and 2000 (0.5%). Not including BY 1992, for which there were no recoveries in the catch, likely as a result of the poorest survival observed for this stock (see next Section), NIC BYERs are the lowest among Fraser River and all other Canadian CWT indicator stocks. Estimated BYERs for NIC average approximately 26%, and range from approximately 10% for BY 2006 to approximately 47% for BY 1988. The estimates of IM remained relatively stable, averaging approximately 11% for the entire time series, and ranging from 5% for BY 2000 to 21% for BY 1990. Lastly, BYER for SHU averaged approximately 53%, and ranged from 30% for BY 1997 to 79% for BY 1988. SHU BYER IM has remained relatively stable, averaging approximately 21% for the entire time series and ranging from 14% for BY 1990 to 37% for BY 1997.



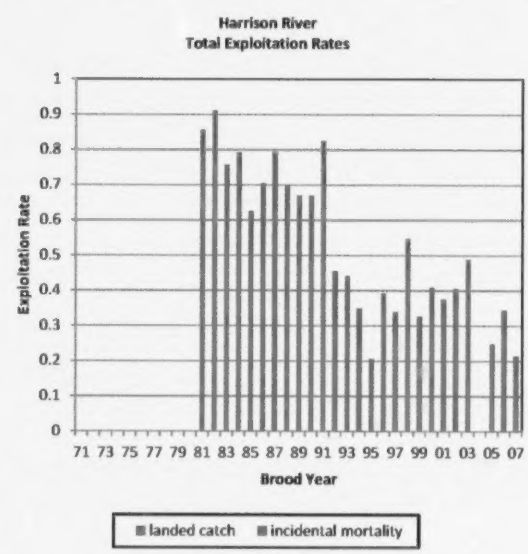


Figure 2.17 Total brood year exploitation rate for Fraser Late stocks. Catch and incidental mortality are shown. Only completed brood years are included.

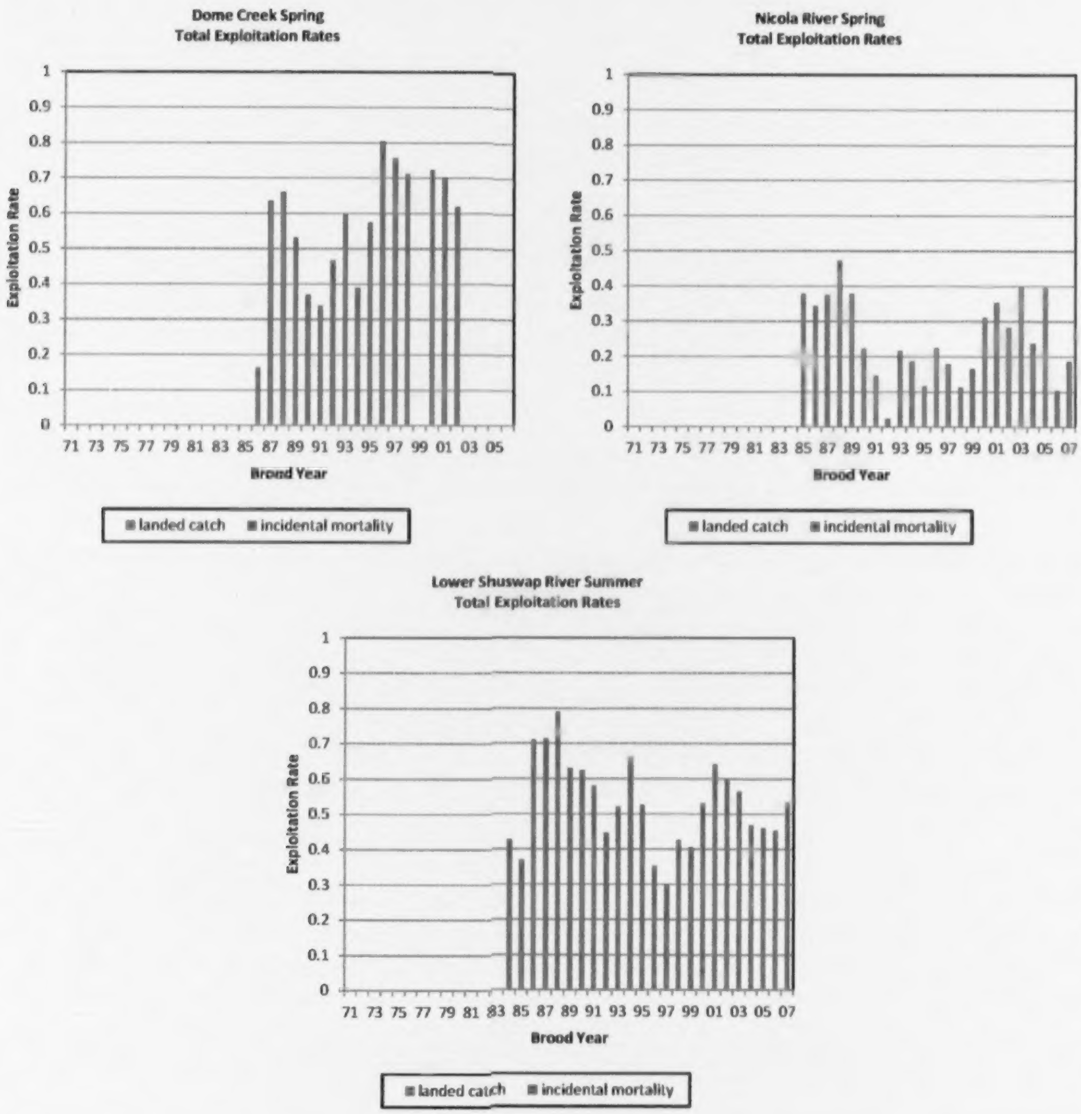


Figure 2.18 Total brood year exploitation rate for Fraser Early stocks. Catch and incidental mortality are shown. Only completed brood years are included.

2.2.5.2 *Survival Rates*

Estimated survival rates for CHI, HAR, and SHU represent survival to age 2 because juveniles from those stocks enter the ocean as subyearlings. Estimated survival rates for DOM and NIC represent survival to age 3 because smolts from those stocks enter the ocean as yearlings and age 3 is the youngest age recovered. If the first BY of the time series for CHI and HAR is removed, there is no apparent trend for the survival rates of Fraser River indicator stocks. Moderate correlations exist between survival and EV indices for CHI and HAR; $r = 0.68$ for the CHI and $r = 0.45$ for HAR. Correlations between EV and survival indices for Fraser Early indicator stocks are weak, however, with $r \leq 0.25$ for each of the indicators.

For CHI, survival averaged 11.6%, with a range of 1.6–29.9% (the highest observed for any Fraser River stock). Estimated survival rates for HAR averaged approximately 3.6%, and ranged from 0.4% in BY 1981 to a high of 23.6% for BY 1991 (Figure 2.19). For the Fraser Early indicator stocks, DOM survival rates averaged 1.2% and ranged from a low of 0.2% for BY 1994 to 2.5% for BY 1993. NIC survival rates averaged 3.8% with a range of 0.1–14.4%, and the SHU survival rates averaged 3.3% with a range of 0.7–8.4% (Figure 2.20). The survival rate for the last completed brood of the time series was 19.3% for CHI, 5.8% for HAR, 1.4% for NIC, and 2.2% for SHU. DOM has been discontinued, and survival for the last completed BY (2002) was 0.4%.

The strength of the association between the standardized CWT survival indices and the model EVs provides some insights about the representation of the components of specific model stocks. The Fraser Late model stock appears to represent the survival conditions for the CHI more closely than for HAR based on the higher EV survival indices correlation coefficients; this may be a result of the CHI being used to represent the model stock (Figure 2.18). For the Fraser Early model stock, the EVs have a low association with the survival rates for NIC and SHU, but essentially no association with DOM. These low associations for the Fraser Early model stock indicate that one or more aspects of these stocks are poorly represented in the model.

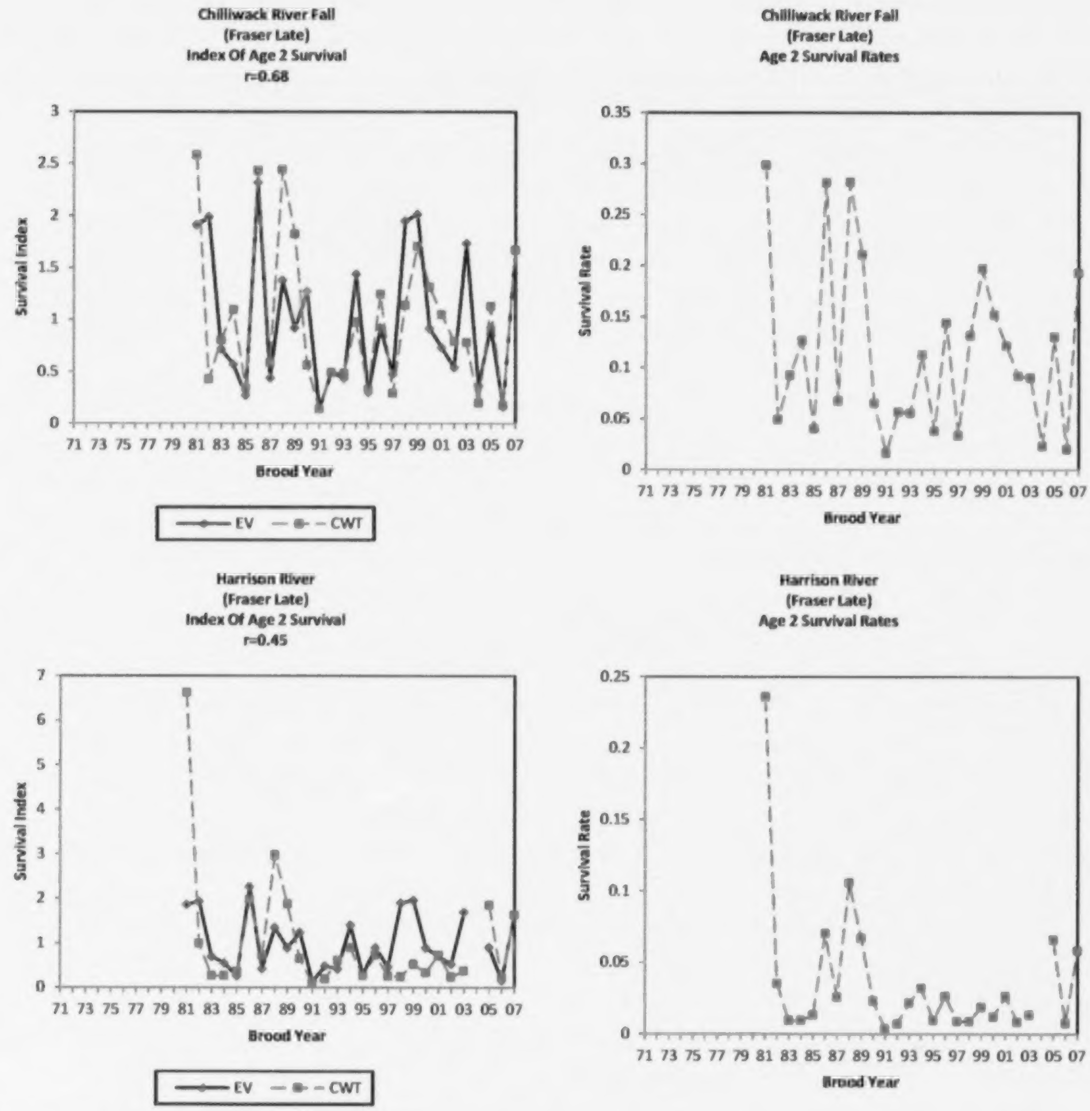


Figure 2.19 CWT survival and EV indices and survival rate for Fraser Late stocks. r: Pearson correlation coefficient between CWT and EV survival indices.

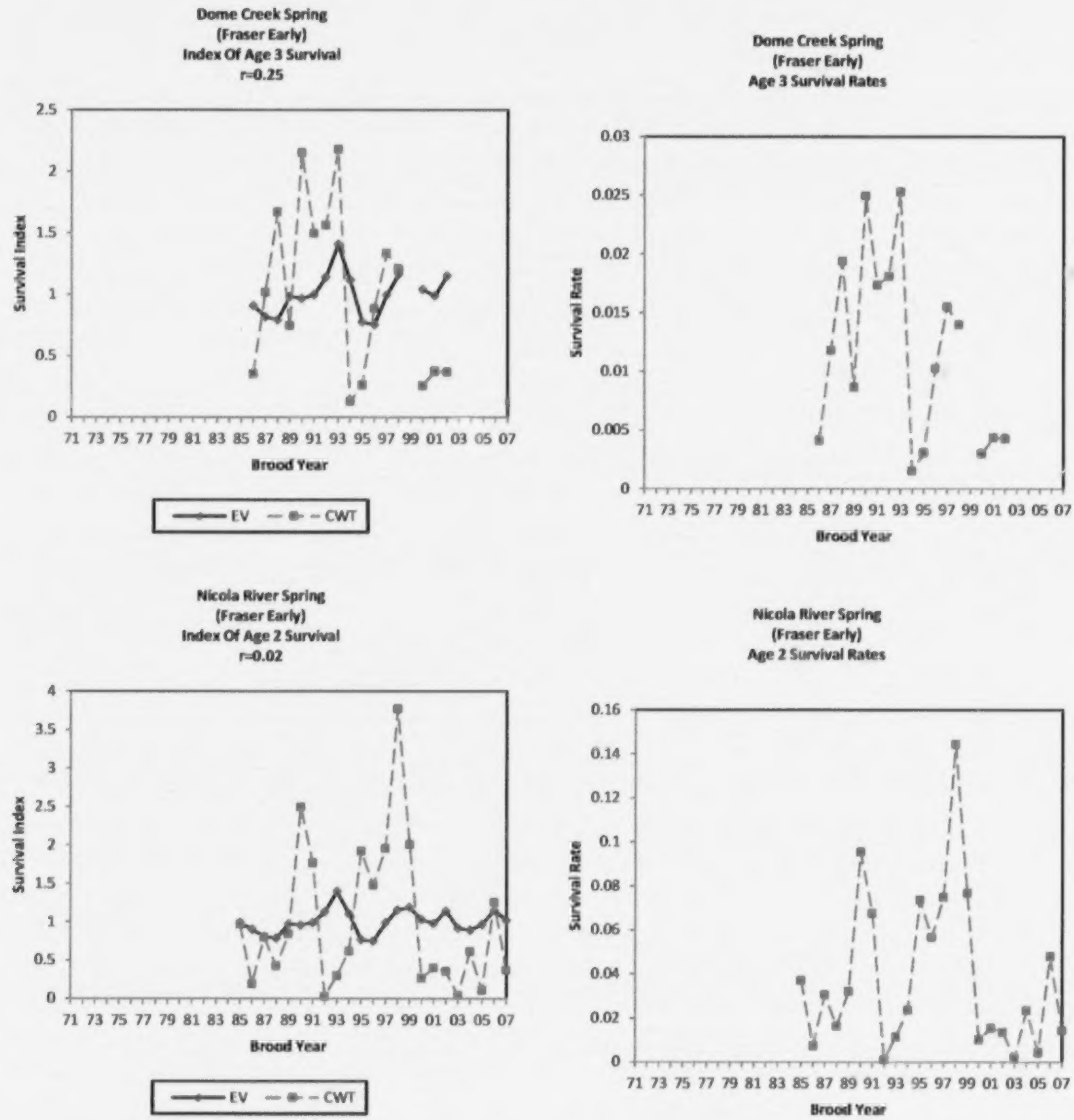
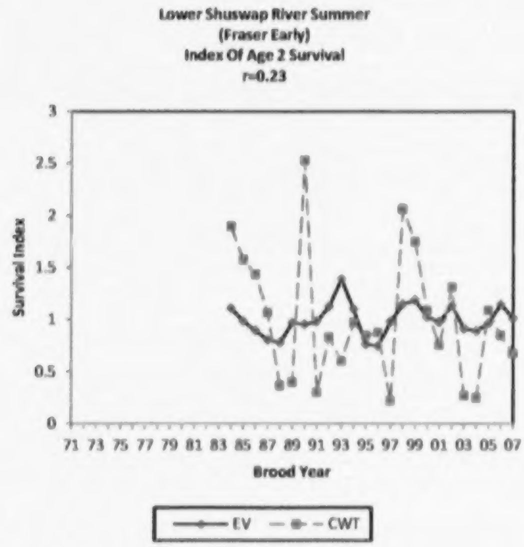


Figure 2.20 CWT survival and EV indices and survival rate for Fraser Early stocks. r: Pearson correlation coefficient between CWT and EV survival indices.



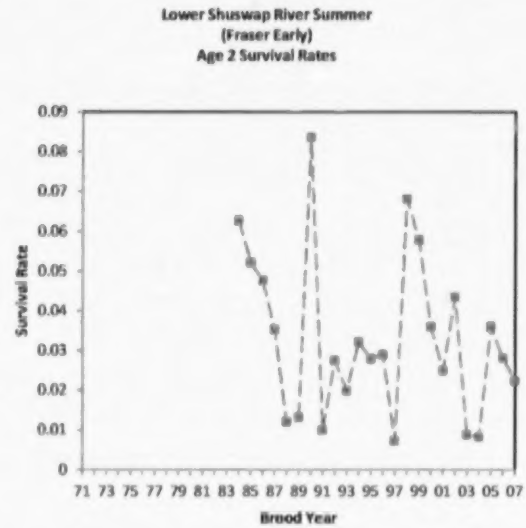


Figure 2.20 Page 2 of 2.

2.2.5.3 *Mortality Distributions*

For the Fraser Late indicator stocks, escapement represented an average of 57% of the CHI total mortality (Figure 2.21; Appendix C5) and 50% of the HAR mortality (Figure 2.21; Appendix C13) between 1985 and 2012 (mortality distribution time series for both stocks began in 1985). From 1999 to 2012, the average proportion of mortality represented by escapement increased to 70% for CHI and to 64% for HAR. For the CHI indicator, fishing mortality was attributed to catch and IM in the ISBM terminal sport (1999–2012 average: 6%), the ISBM WA/OR coast troll (1999–2012 average: 5%), the ISBM Strait of Georgia sport (1999–2012 average: 5%), and the WCVI AABM troll (1999–2012 average: 5%) fisheries. Between 1985 and 1998, the ISBM Strait of Georgia troll fishery was an important component of the total mortality for CHI (average 6%); however, that fishery for Chinook ceased from 1999 onward. For HAR, most of the fishing mortality is associated with catch and IM in the WCVI AABM troll (1999–2012 average: 10%) and the ISBM WA/OR coast troll (1999–2012 average: 8%) fisheries. The ISBM Strait of Georgia sport fishery used to be an important mortality component for HAR during 1985–1998 with 15–19% of the total mortality, but diminished to average mortality levels of 6% during 1999–2012. There is only limited terminal recreational fishing opportunity on HAR.

Among the Fraser Early indicator stocks, an average of 41% of the DOM total mortality (Figure 2.21; Appendix C8), 73% of the NIC total mortality (Figure 2.21; Appendix C21), and 47% of the SHU total mortality (Figure 2.21; Appendix C30) are represented by escapement during 1988–2012 (note that the DOM mortality distribution time series is truncated to 1991–2006; the NIC time series began in 1989, and SHU series began in 1988). The proportion of the average mortality represented by escapement decreased to 31% for DOM, increased to 76% for NIC and 52% for SHU during 1999–2012 (1999–2007 for DOM). Fishing mortality for DOM was predominantly attributed to catch and IM in the ISBM Canada net fishery (1999–2012 average:

44%), followed by the ISBM Strait of Georgia sport fishery (1999–2012 average: 14%). For NIC, the majority of the total fishing mortality occurred as catch and IM in the ISBM terminal sport (1999–2012 average: 8%) and the ISBM Canada net (1999–2012 average: 8%) fisheries. From 1996 to 1998, the ISBM Puget Sound sport fishery used to be an important component of the mortality for NIC (averaging approximately 4%); however, that contribution declined to an average of less than 1% during 1999–2012. Lastly, most of the fishing mortality for SHU is associated with catch and IM in the SEAK AABM troll (1999–2012 average: 11%), NBC AABM sport (1999–2012 average: 8%), and the NBC AABM troll (1999–2012 average: 7%) fisheries. ISBM Strait of Georgia sport and ISBM Canada net fisheries are also important mortality components for SHU, each averaging 6% during 1999–2012.

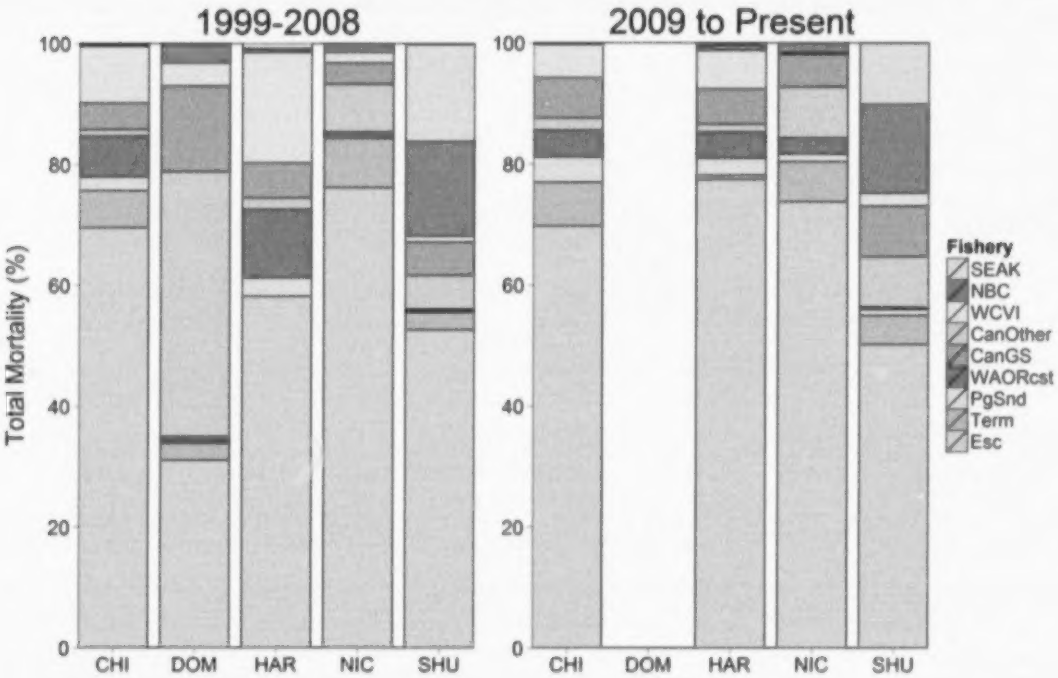


Figure 2.21 Distribution of total mortality for the Fraser River indicator stocks for the current (2009–present) and previous (1999–2008) agreement periods.

2.2.6 Regional Summary for Canadian Stocks

With exception of the RBT indicator stock, for which BYER represents ocean fishing mortality, BYERs in Canadian indicator stocks represent fishing mortality in both ocean and terminal fisheries. Notwithstanding, Strait of Georgia stocks have experienced the largest BYERs among Canadian indicator stocks with lower Strait of Georgia natural stocks COW and NAN experiencing the largest average BYERs (greater than 65%). As in most Canadian indicator stocks, BYERs of Strait of Georgia have been generally declining, except for COW, which experienced a 76% BYER for the last complete BY. In addition to COW, other Canadian stocks that have experienced increasing BYERs are ATN and DOM, with BYERs for the last complete BY

(56% for ATN and 62% for DOM) being greater than their long-term average (Table 2.7). On the other extreme, Fraser Early indicator stock NIC has experienced the lowest BYERs among Canadian indicator stocks with an average of 26% across all complete BYs and 19% BYER for its last complete BY.

Average survival rates to age 2 (to age 3 for KLM and DOM) are 5% or less for all Canadian indicator stocks, except for CHI, which has the largest average survival rate at 11.6% (Table 2.7). CHI also exhibits the largest estimated survival rate (29.9%) for any given BY among all Canadian stocks. Other stocks with BY survival rates greater than 20% are RBT, BQR, and HAR. These high survival rates occurred in all cases in the first few years of the time series. Survival rates for these stocks have clearly subsided relative to those high values, except for CHI, which experienced a survival rate for the last complete BY that is greater than the average and as large as 19.3%. The lowest survival rate for the last complete BY among all Canadian indicator stocks was 0.2% for QUI. This was also QUI's lowest survival rate across all BYs.

Differences in average escapement percentages of the total mortality between Agreement periods 1999–2008 and 2009–2012 were small in most cases (Table 2.7). Important differences occurred only for PPS and HAR. Average escapement percent decreased from 72% during 1999–2008 to 57% during 2009–2012 in PPS, whereas it increased from 58% to 78% in HAR. In terms of the range in escapement percentages observed during the two Agreement periods, in addition to PPS and HAR for which change in average escapement percent reflects important differences in escapement percent range, SHU experienced a substantially wider escapement percent range during 1999–2008 (35–74%) than during 2009–2012 (49–51%). Nonetheless, SHU's average escapement percent was similar (53% for 1999–2008, and 51% for 2009–2012) for those two periods.

Table 2.7 Summary of statistics generated by the 2012 CWT cohort analysis for Canadian indicator stocks by region. Statistics include total mortality (catch plus incidental mortality) brood year exploitation rate (BYER), cohort survival rate to age 2 (age 3 for KLM and DOM), and calendar year (CY) percent distribution of the total mortality in the escapement for Agreement periods 1999–2008 and 2009–present.

						CY % Escapement[1]		
		BYER (total mortality)		**Survival rate**		**1999–2008**	**2009–current**	
Region	**Indicator Stock**	Mean (range)	Last complete BY	Mean (range)	Last complete BY	Mean (range)	Mean (range)	Last CY (if ≠ current)
North/ Central B.C.	Kitsumkalum (KLM)	42% (23–67%)	31%	1.0% (0.1–2.4%)	1.1% (2006)	60% (48–68%)	63% (53–70%)	53%
	Atnarko (ATN)	41% (30–59%)	56%	2.3% (0.5–4.9%)	1.0% (2006)	57% (41–76%)	54% (44–74%)	74%
WCVI	Robertson Creek (RBT)	45%[2,3] (25–77%)	37%	5.0% (0.01–21.1%)	4.4% (2007)	46% (20–84%)	41% (32–61%)	31%
Georgia Strait	Quinsam (QUI)	58% (31–84%)	37%	2.3% (0.2–9.3%)	0.2% (2006)	60% (48–77%)	58% (53–63%)	54%
	Big Qualicum (BQR)	62% (33–88%)	33%	2.7% (0.1–25.6%)	0.5% (2007)	59% (50–74%)	60% (51–65%)	51%
	Cowichan (COW)	70% (37–89%)	76%	2.0% (0.3–7.0%)	0.7% (2007)	34% (24–59%)	36% (18–52%)	37%
	Nanaimo (NAN)	66% (36–91%)	36%	2.2% (0.6–5.8%)	3.0% (2004)	53% (39–75%)	NA	75% (2006)
	Puntledge (PPS)	54% (12–87%)	28%	1.2% (0.1–12.4%)	0.8% (2007)	72% (48–89%)	57% (17–76%)	17%
Fraser River	Chilliwack (CHI)	44% (23–83%)	27%	11.6% (1.6–29.9%)	19.3% (2007)	70% (60–78%)	70% (67–76%)	68%
	Harrison (HAR)	53% (21–91%)	21%	3.6% (0.4–23.6%)	5.8% (2007)	58% (37–77%)	78% (76–80%)	77%
	Dome (DOM)	57% (16–80%)	62%	1.2% (0.2–2.5%)	0.4% (2002)	31% (15–44%)	NA	43% (2006)
	Nicola (NIC)	26%[2] (10–47%)	19%	3.8% (0.1–14.4%)	1.4% (2007)	76% (55–89%)	74% (52–91%)	72%
	Lower Shuswap (SHU)	53% (30–79%)	53%	3.3% (0.7–8.4%)	2.2% (2007)	53% (35–74%)	51% (49–51%)	51%

[1] % Escapement is not a measure of performance for the escapement indicator stock(s) associated with a given CWT indicator stock. See CTC (2013) for these details.

[2] Does not include BY 1992 from which there were no CWT recoveries in the catch due to extremely low survival rates

[3] BYER based on ocean exploitation rate; terminal exploitation rate is not included because fishing mortality on hatchery fish does not represent fishing mortality on wild fish.

2.2.7 Washington Coast Stocks

Coded wire tagged Chinook are currently released from three separate facilities on the Washington Coast and are used by the CTC to represent natural fall Chinook production in the rivers between the Columbia River in the south to the Strait of Juan de Fuca in the north. Indicator stocks include the Queets River (QUE, released from Quinault Department of Natural Resources Salmon River Hatchery) and Sooes River (SOO, released from the U.S. Fish and Wildlife Service Makah National Fish Hatchery) on the coast, and the Hoko River at the western end of the Strait of Juan de Fuca (HOK, released from Makah's Hoko Falls Hatchery). Additionally, Chinook releases from the Washington Department of Fish and Wildlife (WDFW) Elwha Hatchery (ELW) were formerly used in the annual ERA, but releases of adipose clipped + CWT Chinook have been insufficient for analysis since BY 1994. Queets, Sooes, and Hoko indicators share a common life history—they are ocean type (fingerling releases), fall-timed fish with a maximum age at maturity of 6. These three stocks also have extensive historical tagging and recovery coverage (20+ completed BYs), with Hoko and Sooes records starting in 1985 and Queets records starting in 1977.

2.2.7.1 *Brood Year Exploitation Rates*

BYER patterns for Hoko, Queets, and Sooes are considered in terms total exploitation (ocean and terminal; Figure 2.22; Table 2.8). BYERs for Hoko and Sooes indicator stocks have tracked closely for the entirety of their time series (series mean: Hoko 0.34, Sooes 0.41) with relatively higher values (*ca.* 0.60) being observed for the first two BYs on record (1985–1986), and BYERs varying between *ca.* 0.10 and 0.50 thereafter (most recent [2006] BY: Hoko 0.34, Sooes 0.47). Approximately one quarter of all fishery-related mortality for HOK and SOO is in the form of nonlanded, incidental impacts. Across its 29 complete BY, the total BYER for the Queets indicator stock has averaged 0.62, ranging between 0.37 and 0.81, and displaying no discernible temporal trend. The BYER for the last complete Queets BY (2006) is 0.54.

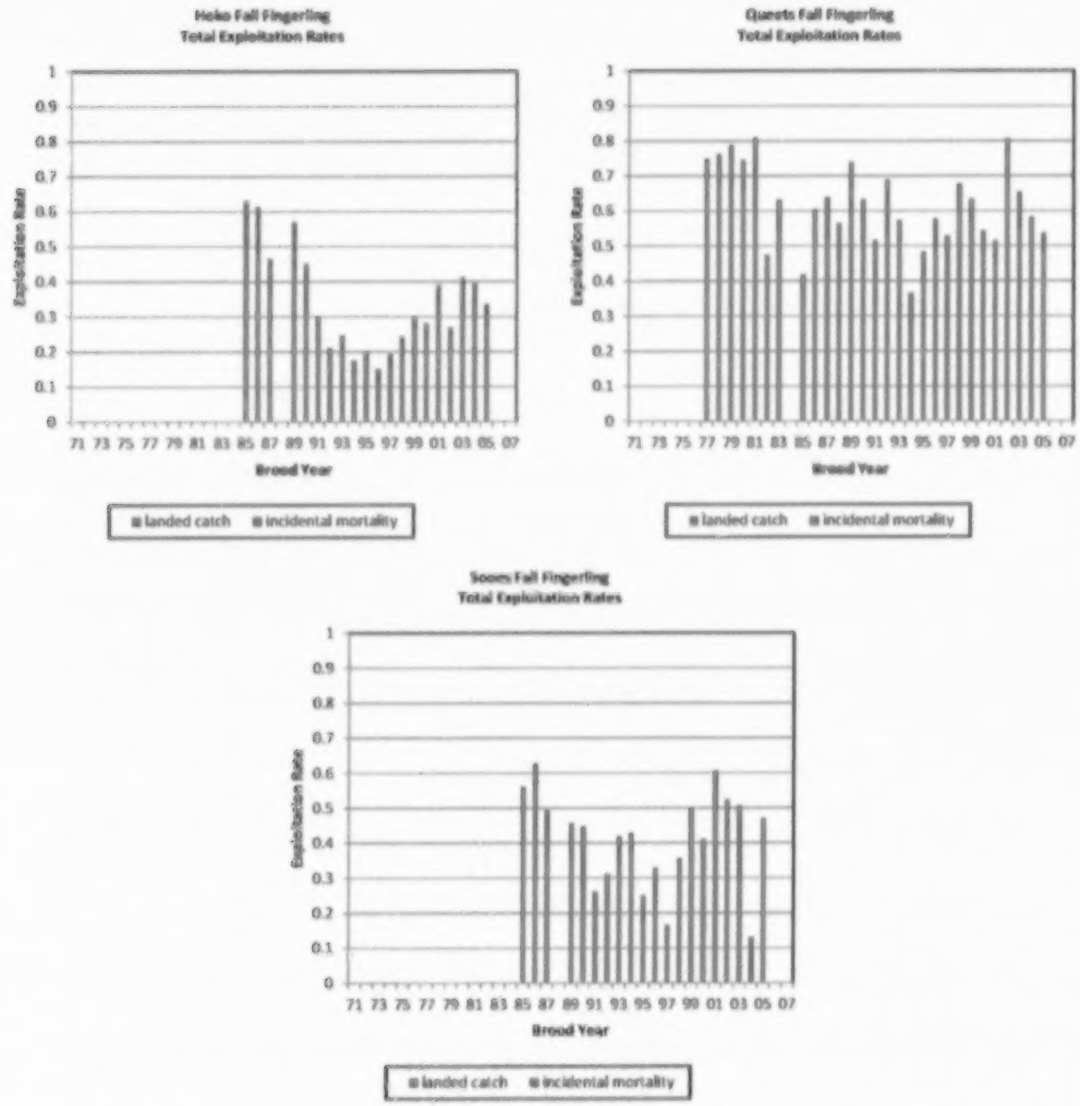


Figure 2.22 Brood year exploitation rate in terms of landed catch and incidental mortality for Washington coast indicator stocks.

Table 2.8 Summary of statistics generated by the 2012 CWT cohort analysis for Washington Coast indicator stocks. Statistics include total mortality (catch plus incidental mortality) brood year exploitation rate (BYER), cohort survival rate to age 2, and calendar year (CY) percent distribution of the total mortality in the escapement for Agreement periods 1999–2008 and 2009–present.

		BYER (total mortality)		Survival rate		CY % Escapement[1]		
						1999–2008	2009–present	
Stock Abbrev.	Indicator Stock Name	Mean (range)	Last complete BY	Mean (range)	Last complete BY	Mean (range)	Mean (range)	Last CY (if ≠ current)
HOK	Hoko	34% (15–63%)	34%	1.38% (0.12–3.20%)	0.93% (2005)	70% (45–89%)	79% (70–86%)	82%
QUE	Queets	62% (37–81%)	54%	2.21% (0.53–4.45%)	4.11% (2005)	40% (19–70%)	38% (36–40%)	36%
SOO	Sooes	41% (13–63%)	47%	0.51% (0.01–1.57%)	0.61% (2005)	57% (29–83%)	71% (64–75%)	73%

[1] % Escapement is not a measure of performance for the escapement indicator stock(s) associated with a given CWT indicator stock. See CTC (2013) for these details.

2.2.7.2 *Survival Rates*

CWT data indicate that release-to-age-2 survival for Chinook on the Washington Coast indicator stocks is highly variable across stocks and years (Figure 2.23; Table 2.8). Sooes Chinook salmon, for instance, consistently experience some of the lowest survivals of any CWT indicator stock evaluated by the CTC. The series-wide mean survival from release to age 2 for this stock is 0.5%, but it has ranged more than two orders of magnitude (0.01–1.5%). The Queets Chinook indicator stock exhibits the highest survival rates among the three indicator stocks, with a range of 0.5–4.5%, and a mean of 2.2%. Hoko Chinook survival rates lie between these extremes with a mean of 1.4% and a range of 0.1–3.2%. Across their entire time series, there is little evidence of a long-term trend in early marine survival and limited evidence of covariation among stocks, i.e., SOO versus QUE correlation coefficient $R = 0.63$; SOO-HOK and QUE-HOK $R = 0.29$. In terms of more recent performance, the survival rates of all three indicator stocks have declined considerably from the series-wide highs observed for the 1999 BY with some rebounding in the Queets stock, but only the most recent BY is increasing for Hoko and Sooes.

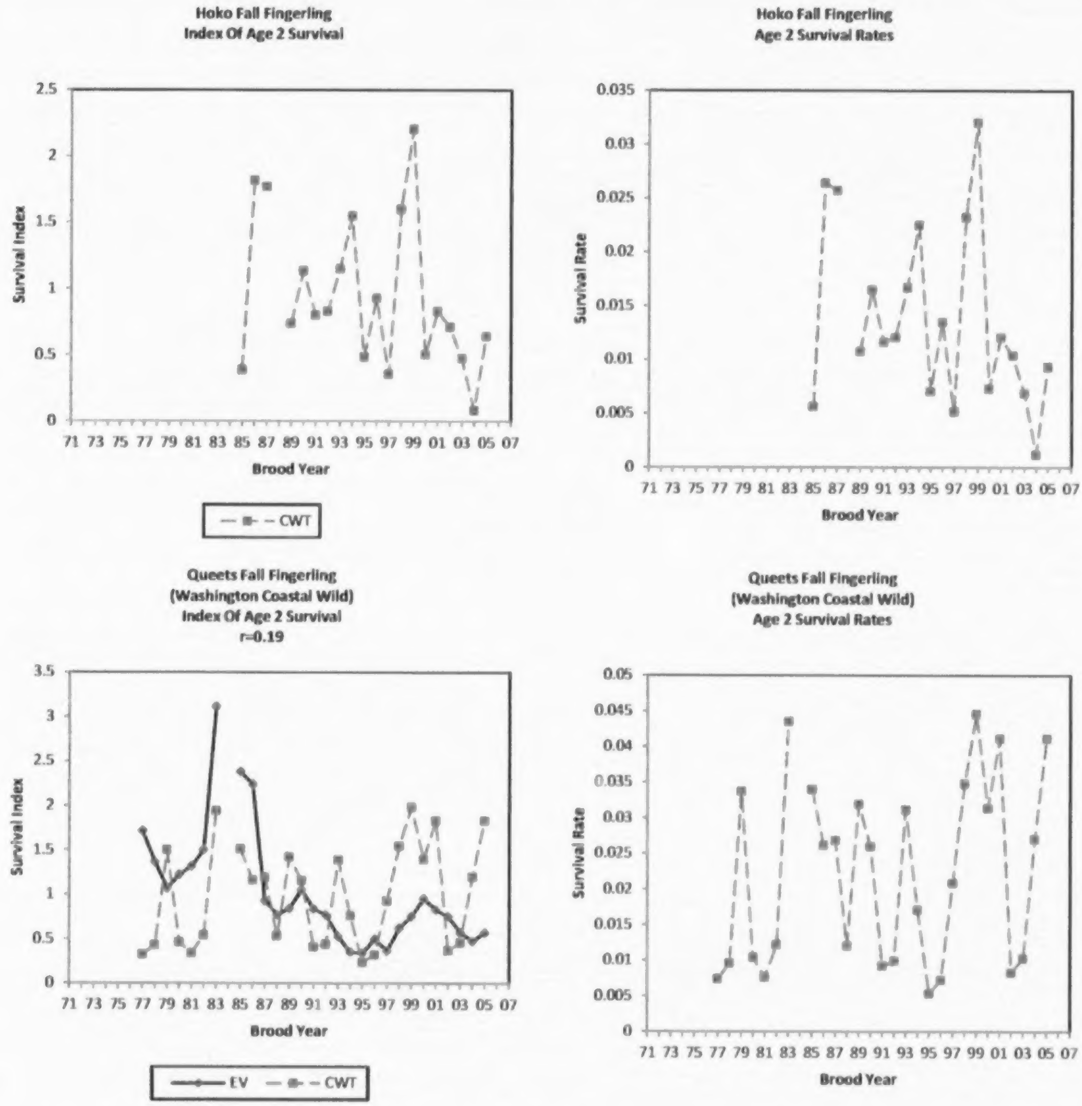


Figure 2.23 CWT survival index and survival rate for Hoko, Queets, and Sooes Fall Fingerling stocks. r: Pearson correlation coefficient between CWT and EV survival indices.

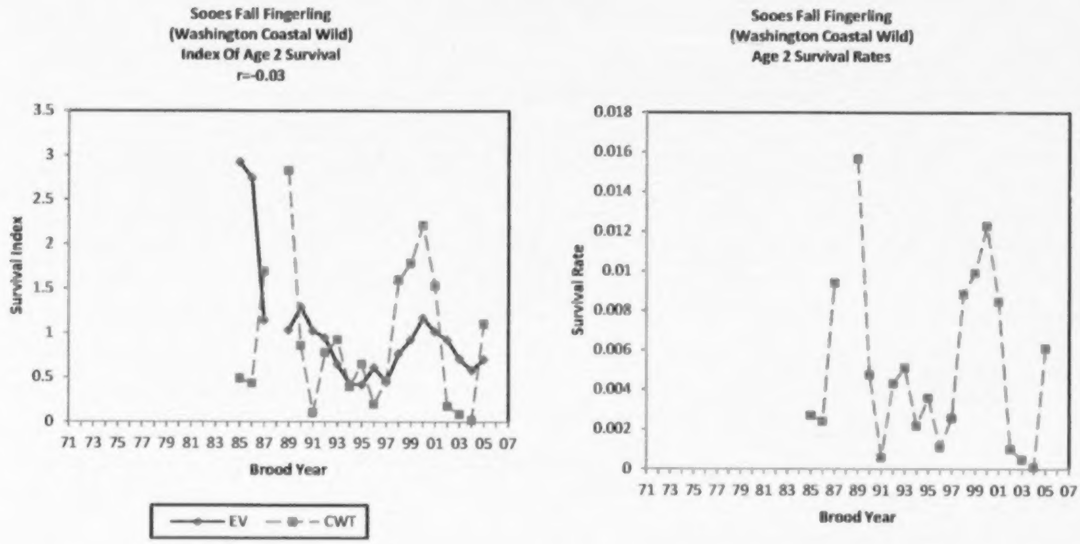


Figure 2.23 Page 2 of 2.

2.2.7.3 *Mortality Distributions*

Washington coastal indicator stocks exhibit a mortality distribution consistent with a far north migration pattern. On average, 86% of all fishery-related mortality, which accounts for approximately a third of total mortality, results from fisheries occurring north of the U.S. and Canada border. The majority of these mortalities occur in the SEAK and NBC AABM troll fisheries (Figure 2.24; Appendix C14, C27, and C34). Whereas southern U.S. fishery-related mortalities are virtually nonexistent (1–5%) for the Hoko and Sooes indicator stocks, terminal net fisheries targeting Queets River fall-run Chinook account for 17% of the annual mortality distribution, on average. Escapement recoveries for the three stocks have averaged between *ca*. 40% (Queets) and 70–80% (Hoko) of the total distribution in recent years (Table 2.8). Lastly, beyond reductions in mortality occurring in the WCVI troll fishery (all three stocks), modest increases occurring in Strait of Georgia sport (HOK and SOO), and a shift towards a higher escapement fraction prior to the 1999 Agreement (Appendix C), there is limited evidence of a systematic shift in mortality distributions for these stocks between the current (2009) and prior agreement period (1999; Figure 2.24).

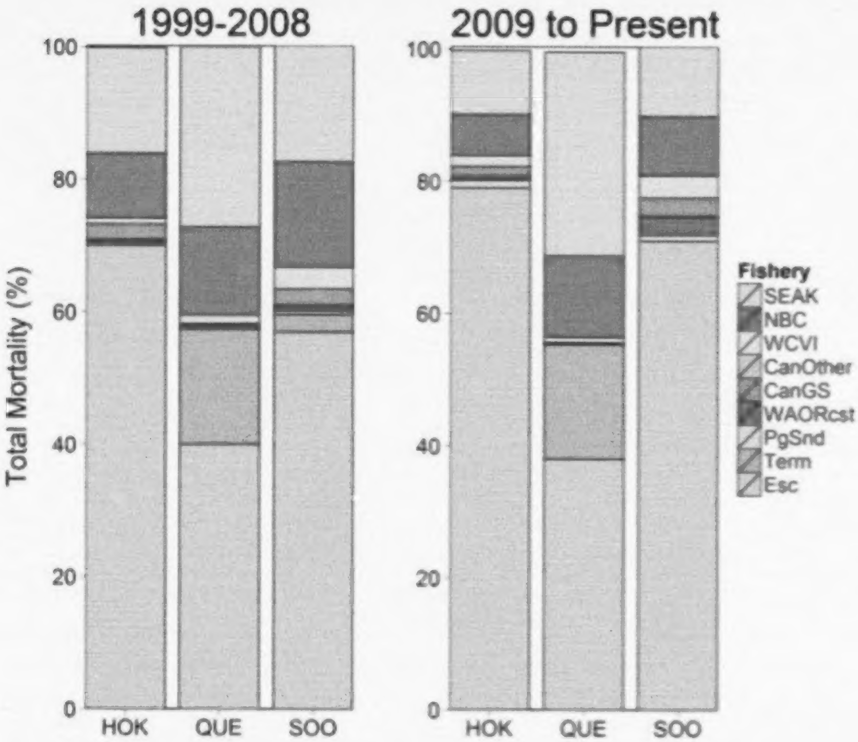


Figure 2.24 Distribution of total mortality for Washington Coast indicator stocks for the previous (1999–2008) and current (2009–present) agreement periods.

2.2.8 Washington Salish Sea Stocks

There are 14 CWT indicator stock groups analyzed within the Washington Salish Sea. The analysis on two additional stocks, Squaxin Net Pens and University of Washington accelerated rearing production, was discontinued with the phase out of these production units. The indicator stocks are a mixture of traditional hatchery production for harvest purposes, and natural stock supplementation programs from brood stock collected on the spawning grounds. Except for one stock, White River Spring yearlings, these CWT indicator groups are adipose clipped (marked), and therefore available for retention mark-selective sport fisheries, which have been expanding in marine and freshwater fisheries in the Salish Sea since 2003. Current marine nontribal sport fisheries within Puget Sound are almost exclusively under mark-selective regulations. Consequently, estimates of fishing mortality from these adipose clipped CWT recoveries will likely overestimate the fishing mortality on unmarked natural fish that must be released. Because of different terminal fishery structure for these indicator groups due to mark-selective fisheries or directed fisheries on hatchery surplus, BYERs are expressed in terms of ocean fisheries for all of these indicators. The portion of the fishery impacts in marine area mark-selective sport fisheries are included in the ocean exploitation rate estimates presented below. Salish Sea origin stocks have the highest exposure to differential harvest rates from

mark-selective fisheries; consequently, the BYER estimates may be biased high with respect to the exploitation rates on natural stocks. Details on the CWT indicator stock groups and influence of mark-selective and terminal fisheries on the estimates are presented in the regional subsections below.

2.2.8.1 *Northern Puget Sound*

Indicator stocks in northern Puget Sound include Fingerling and yearling Spring tag groups from Nooksack River (NSF, NKS) and Skagit River (SKF, SKS) and Summer/Fall Fingerling groups from Samish (SAM) and Skagit (SSF) rivers. Nooksack and Skagit Spring stocks are listed in the Northern Puget Sound Natural Spring stock group in Attachment IV and V. Releases of yearling spring Chinook salmon into the Nooksack River was discontinued following the 1996 BY. The Nooksack Spring hatchery program is primarily for the purpose of natural supplementation and also supports a small tribal subsistence fishery in the river. The SAM stock indicator does not represent an associated natural stock but is important for evaluating the large hatchery production program from Samish Hatchery. The Skagit Spring program is primarily for harvest augmentation; the returning fish are subjected to a fairly intensive MSF in the area near the hatchery. The primary purpose for the Skagit summer fingerling group is fishery evaluation on the natural stock in the system. Brood stock for this program is captured on the spawning grounds. The yearling program in the Skagit River has been discontinued. The last release was the 2010 BY, released in spring of 2012.

2.2.8.1.1 Brood Year Exploitation Rates

The BYER for NSF has been on an increasing trend since the start of releases in the early 1990s, reaching 56% in 2007 (Figure 2.25). Since 1995, the ocean fishery BYERs for the other northern Puget Sound indicator stocks show no trend for SAM (range 29–48%) and SSF (range 21–41%), but during BYs 1995–2007 show a declining trend for SKS (41–20%) and SKF (42–17%; Figure 2.26; Figure 2.27). The BYER for SAM includes fishery mortalities in the Bellingham Bay terminal net fishery.

The most recent five-year average BYERs for current programs are 54% for NSF, 22% for SKF, 27% for SKS, 34% for SAM and 30% for SSF.

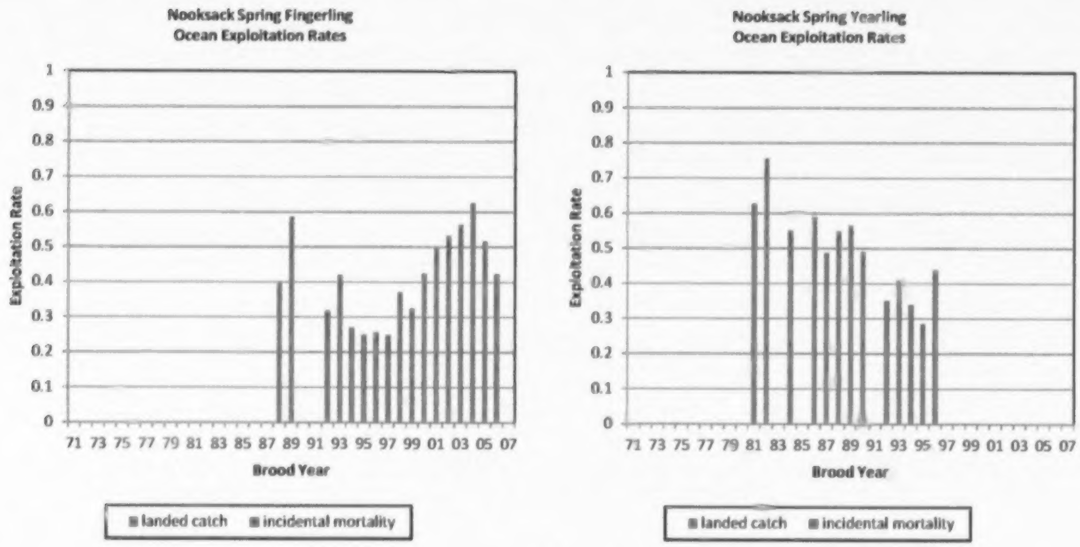


Figure 2.25 Brood year exploitation rate in terms of landed catch and incidental mortality for Nooksack Spring Fingerling and Nooksack Spring Yearling CWT indicator stocks.

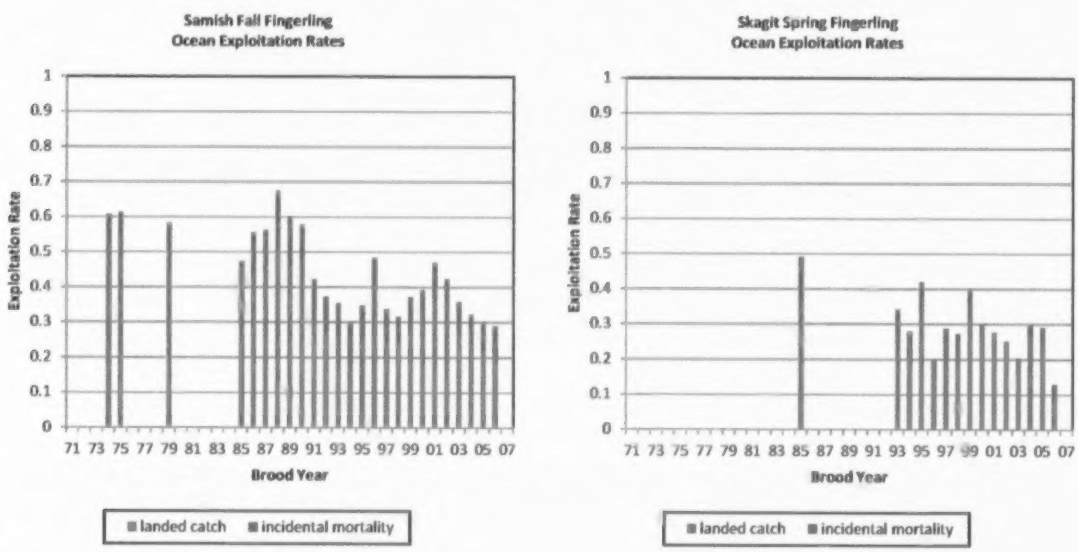
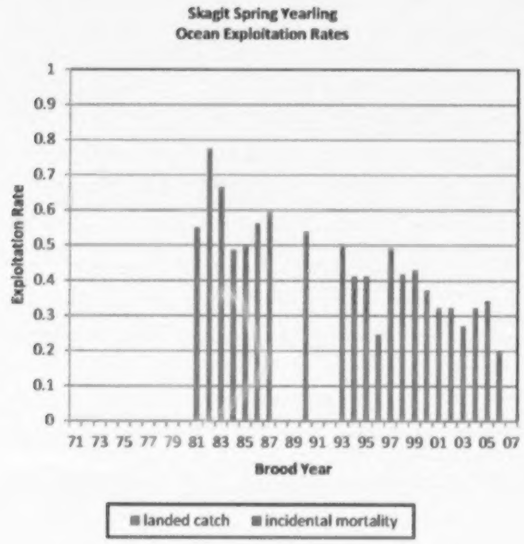


Figure 2.26 Brood year exploitation rate in terms of landed catch and incidental mortality for Samish Fall Fingerling and Skagit Spring Fingerling CWT indicator stocks.



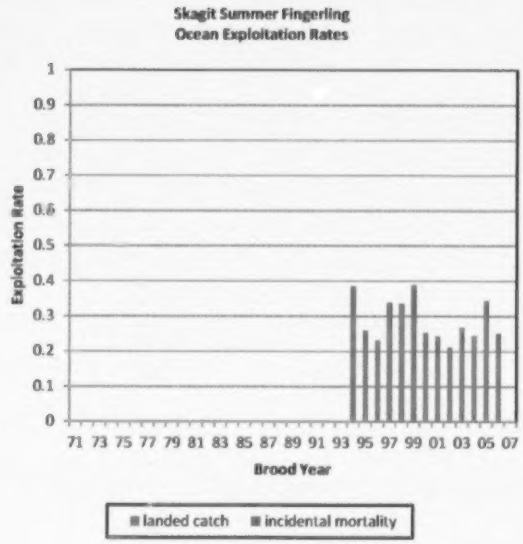
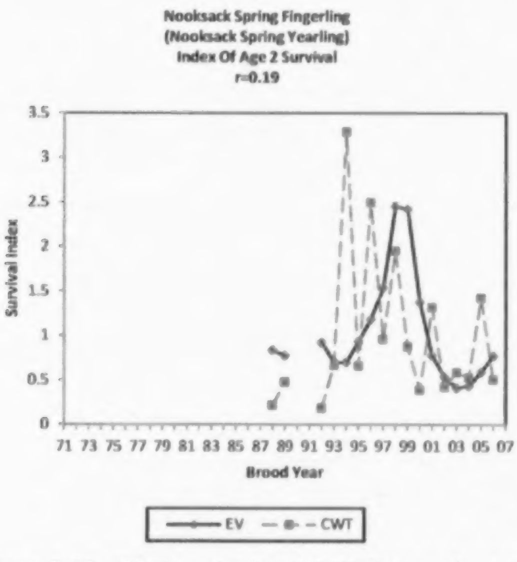


Figure 2.27 Brood year exploitation rate in terms of landed catch and incidental mortality for Skagit Spring Yearling and Skagit Summer Fingerling CWT indicator stocks.

2.2.8.1.2 Survival Rates

Since the mid-1990s, survival rates from release to age 2 (fingerlings) or age 3 (yearlings) for northern Puget Sound indictor stocks have no obvious trends (Figures 2.28–2.33). More recently, survival rates have been in the range of 1–5%. The survival index and the EV were moderately correlated for SAM (r = 0.64) and poorly correlated for NSF (r = 0.19) and NKS (r = 0.10).



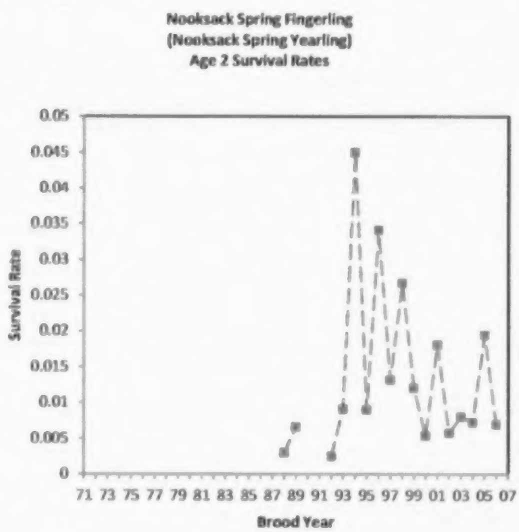


Figure 2.28 CWT survival and EV indices and survival rate for Nooksack Spring Fingerling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

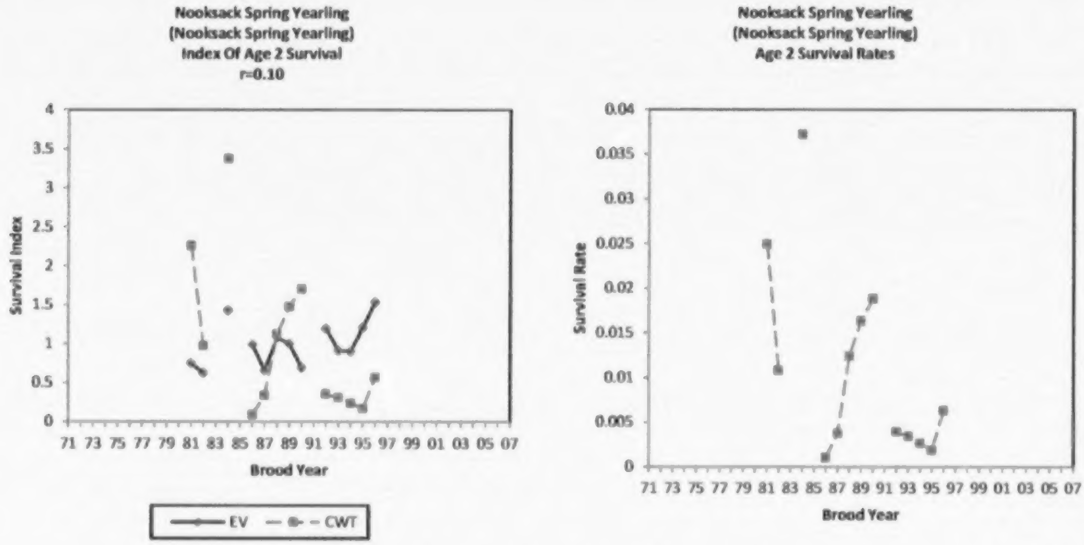


Figure 2.29 CWT survival and EV indices and survival rate for Nooksack Spring Yearling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

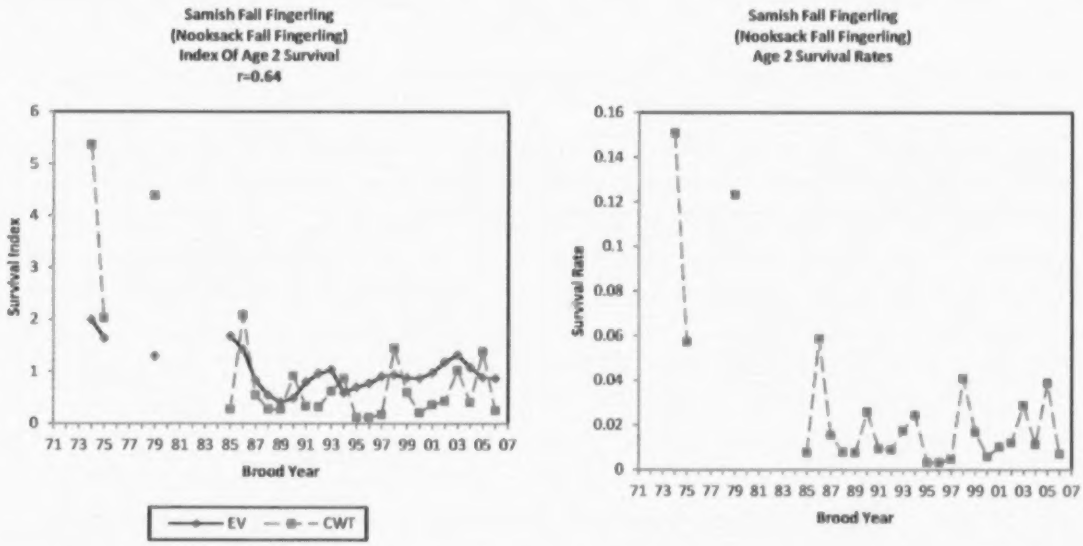


Figure 2.30 CWT survival and EV indices and survival rate for Samish Fall Fingerling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

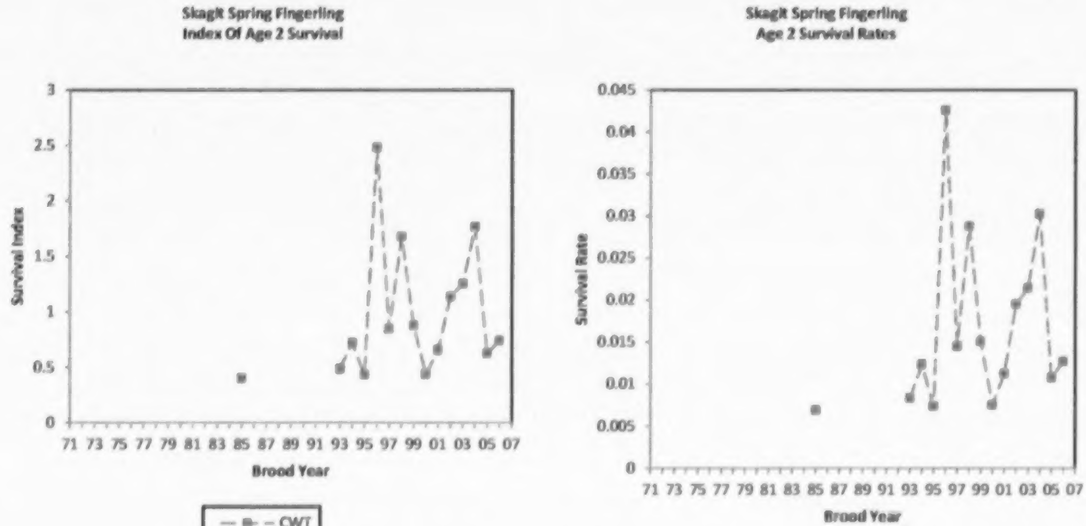


Figure 2.31 CWT survival index and survival rate for Skagit Spring Fingerling stock.

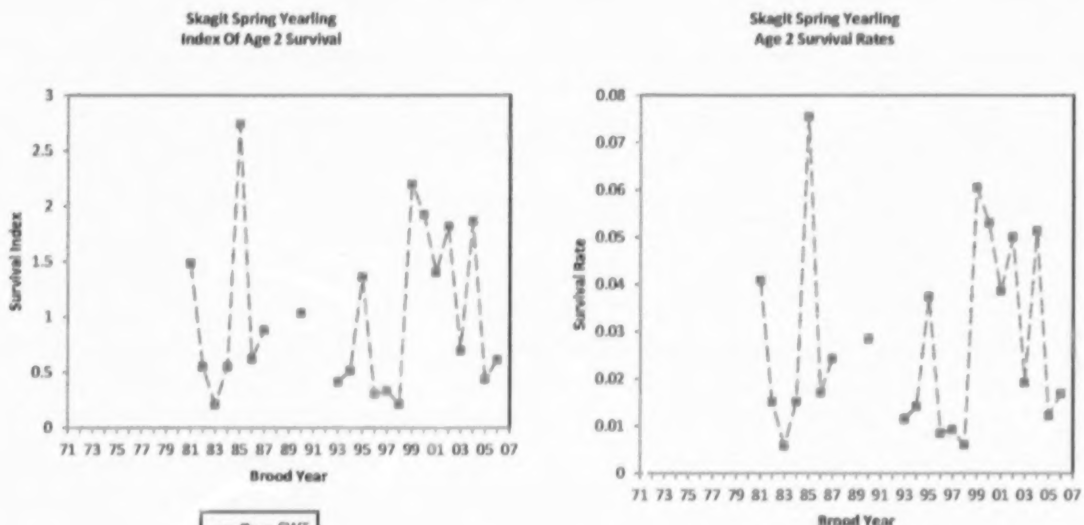


Figure 2.32 CWT survival index and survival rate for Skagit Spring Yearling stock.

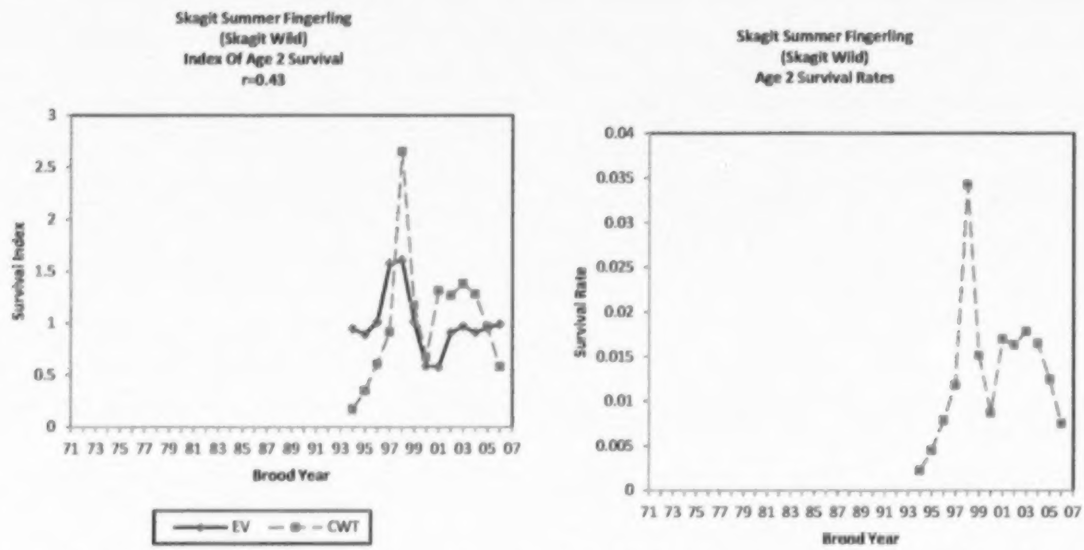


Figure 2.33 CWT survival and EV indices and survival rate for Skagit Summer Fingerling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

2.2.8.1.3 Mortality Distributions

Percent distribution in total AEQ fishery mortality for the North Puget Sound stocks during 1999–2011 averaged 40% for NKS (Appendix C23; one year only, 1999), 46% for NSF (Appendix C24), 75% for SAM (Appendix C29), 39% for SKF (Appendix C31), 52% for SKS (Appendix C32) and 40% for SSF (Appendix C39; Figure 2.34).

Because of their location and northerly ocean migration, the majority of fishing mortality on North Puget Sound stocks is in Canadian and northern Puget Sound fisheries. Mortality in Canadian fisheries occurs primarily in WCVI, averaging 26% during catch years 1999–2011, while northern Puget Sound fisheries account for 19%, on average, in the same period. Although SSF experienced the highest fishery mortality in SEAK among all Salish Sea stocks (9%) during 1999–2011; for the combined North Puget Sound stock group, the percent mortality in fisheries in SEAK and along the Washington and Oregon coast is low, averaging approximately 2% for these years in each area. Within Puget Sound, the primary fishery intercepting these stocks is the marine sport fisheries, which are now almost exclusively under mark-selective regulations. A significant state and tribal net fishery within Bellingham Bay targets SAM, contributing the majority of the percentage of the value shown under *Puget Sound Net* in Appendix C29. The remaining portion of mortality associated with Puget Sound Net for SAM results from the San Juan Islands net fishery, which is under Fraser Panel control in the late summer and fall. Percentage of fishing mortality in Puget Sound marine and freshwater net fisheries is low, with the exception of SAM and the Skagit River during 2008–2011, when abundance of Skagit Summer/Fall Chinook salmon was high and there was a corresponding directed river net fishery.

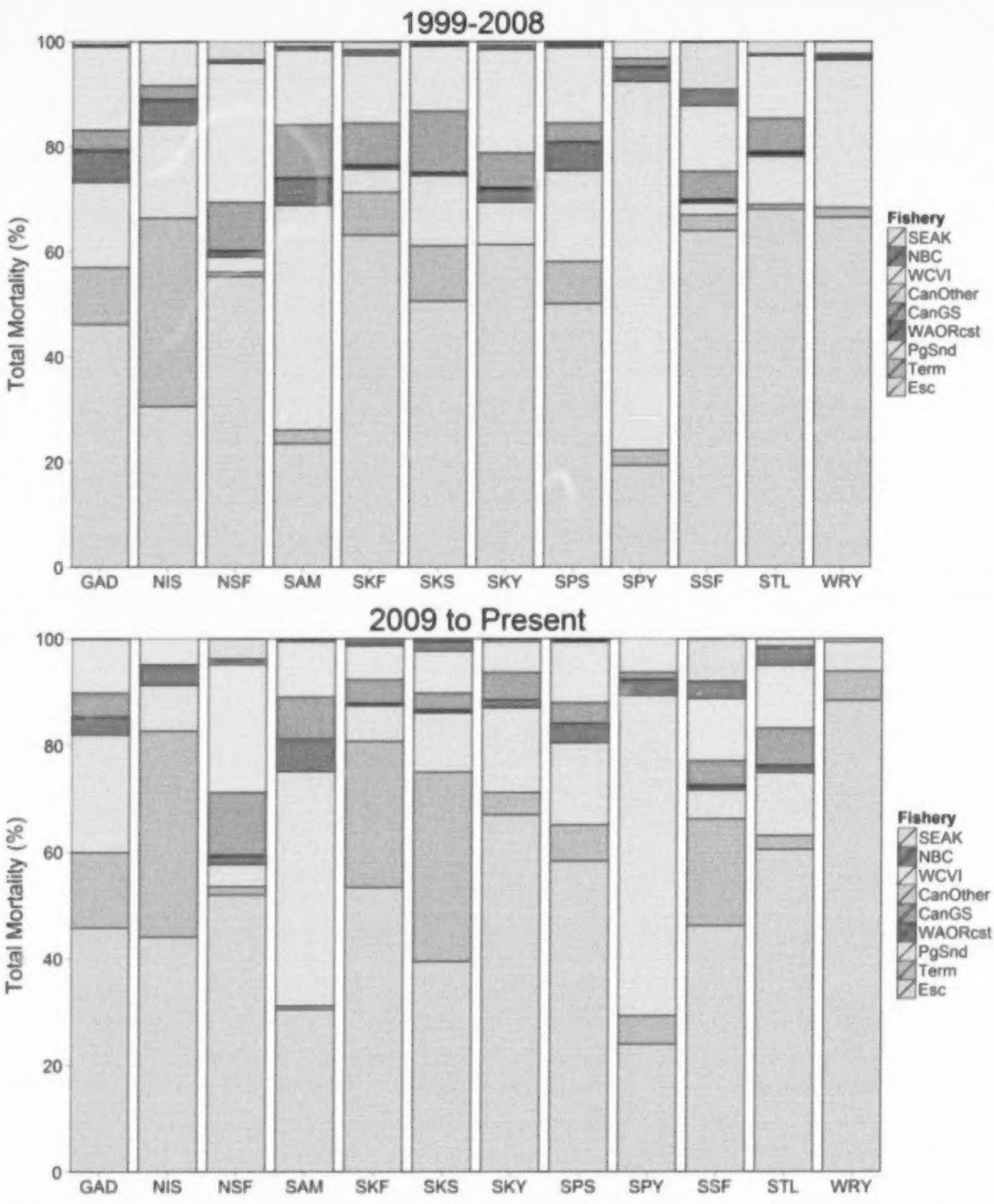


Figure 2.34 Distribution of total mortality for Washington Salish Sea indicator stocks for the previous (1999–2008) and current (2009–present) agreement periods.

For the aggregate group, the distribution of fishing mortality between fisheries north or south of the U.S. and Canada border has shifted slightly during 1999–2011. Fisheries north of the border accounted for an average of 27% of the mortality during 1999–2003 and 20% of the

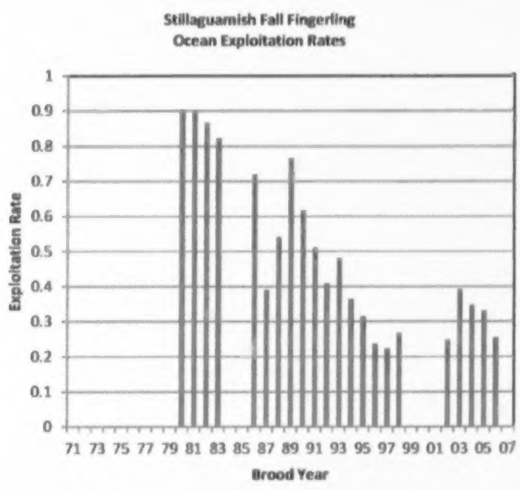
mortality during 2007–2011. During these same years, the fisheries south of the U.S. and Canada border averaged 13% (1999–2003) and 27% (2007–2011) mortality. The increase in recent years for southern U.S. fisheries is primarily due to the implementation of MSFs beginning 2003 and the net fishery in the Skagit River. The percentage distribution in escapement has declined from an average of 62% in 1999–2003 to 53% in 2007–2011.

2.2.8.2 *Central Puget Sound*

Indicator stocks in Central Puget Sound, from north to south, include fingerling tag groups from the Stillaguamish River (STL) and Skykomish River (SKY), a tributary in the Snohomish Basin. The Stillaguamish and Snohomish stocks are listed as part of the Puget Sound Natural Summer/Fall stock group in Attachment IV and V. The Stillaguamish Fall CWT program is primarliy for the purpose of fishery evaluation, and some natural supplementation. Brood stock for this program is captured on the spawning grounds. The Skykomish program, which uses returns of summer run fish to the Wallace Salmon Hatchery for brood stock, is primarily for fishery evaluation, providing some limited harvest in the inriver mark-selective sport fishery when abundance is favorable.

2.2.8.2.1 Brood Year Exploitation Rates

The ocean fishery BYERs have declined dramatically for STL—from 90% for 1980 BY to 37% in 2007 (Figure 2.35). The rates for SKY have only been available starting with the 2000 BY, where BYERs have declined from 42% to 30% (Figure 2.35).



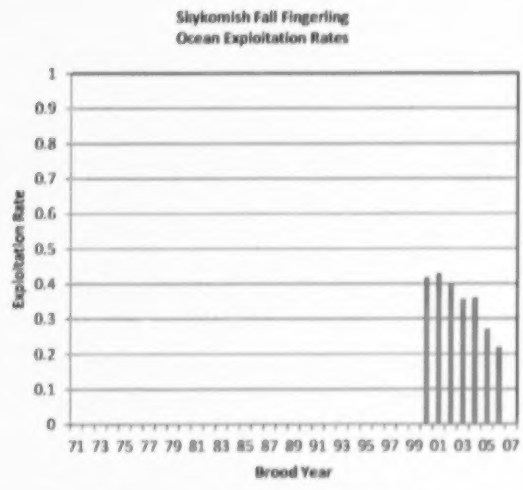


Figure 2.35 Brood year exploitation rate in terms of landed catch and incidental mortality for Stillaguamish Fall and Skykomish Summer Fingerling CWT indicator stocks.

2.2.8.2.2 Survival Rates

Survival rates to age 2 for STL ranged from a low of 0.3% for the 1980 BY to a high of 6.4% in 1990 (Figure 2.36). Cohort survival to age 2 for SKY ranged from 0.4% in 2005 to 1.9% 2004,

(Figure 2.37). The survival index and the EV was moderately correlated for STL with Pearson correlation coefficient of 0.45. The small number of years available for SKY prohibit comparisons between the survival index and the EV.

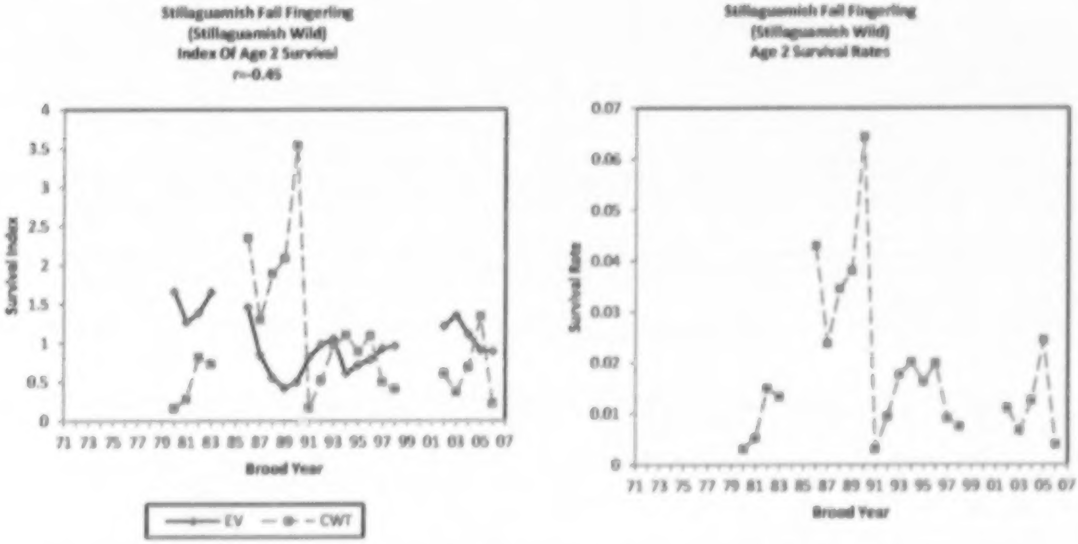


Figure 2.36 CWT survival and EV indices, and survival rates for Stillaguamish Fall Fingerling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

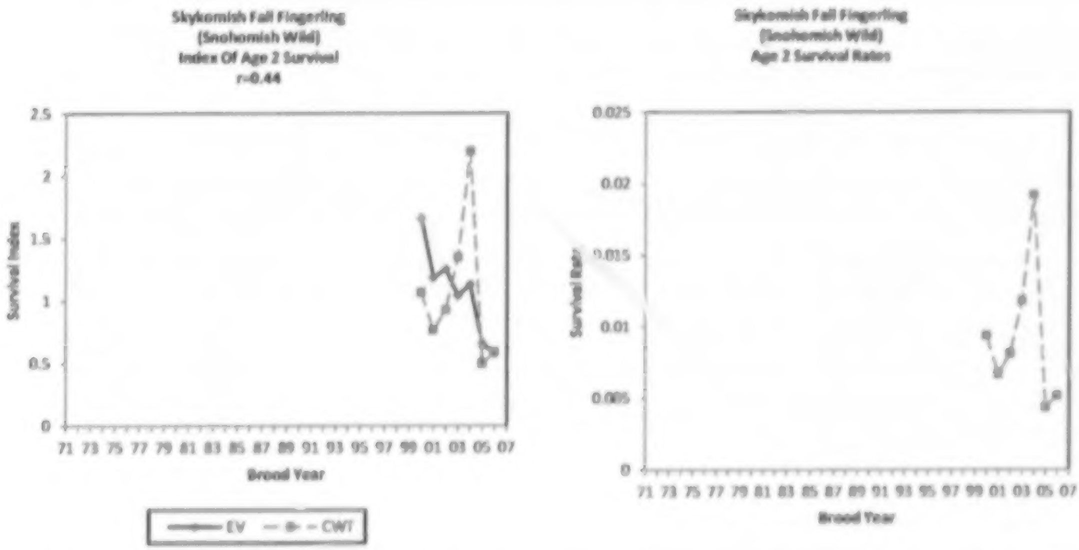


Figure 2.37 CWT survival and EV indices and survival rate for Skykomish Fall Fingerling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

2.2.8.2.3 Mortality Distributions

Percent distribution in total AEQ fishery mortality for the Central Puget Sound stocks during 1999–2011 averaged 37% for SKY (Figure 2.34; Appendix C33), and 34% for STL (Figure 2.34;

Appendix C40). Similar to North Puget Sound stocks, percentage of fishing mortality is very low in SEAK (<3% each) and highest in Canadian fisheries, averaging 21% during 2004–2011 for SKY and 20% for STL during the years with data (1999–2001 and 2006-2011). The average percent mortality in Puget Sound fisheries during 1999–2011 of 13% for SKY and 12% for STL is lower than that for the North Puget Sound group because of the lack of terminal fisheries for these stocks. In recent years, the bulk of the fishery mortalities in Puget Sound have occurred in marine area mark-selective sport fisheries.

During 1999–2011, the two combined stocks experienced an increase in the percentage of mortality in fisheries both north and south of the U.S. and Canada border. For the first three years of this period, fisheries north of the border had 17% of the fishery mortality, and fisheries south of the border had 8% of the fishery mortality. For 2007–2011, percent mortality in northern fisheries increased to an average of 21%. The increase in the southern U.S. fisheries to 17% during 2007–2011 is primarily due to mark-selective sport fisheries and would not correctly represent impacts on natural stocks. The percentage distribution in escapement for the two stocks has declined from an average of 75% in 1999–2001 to 63% in 2007–2011.

2.2.8.3 *South Puget Sound*

Indicator stocks in South Puget Sound include South Puget Sound Fall Fingerling (SPS), South Puget Sound Fall Yearling (SPY), Nisqually Fall Fingerling (NIS), and White River Spring Yearling (WRY). The SPS indicator group is an aggregate of several CWT indicator programs, which is now composed of tag releases from Soos Creek Hatchery in the Green River Basin and Grovers Creek Hatchery on the western shore of Puget Sound across from Seattle. The SPS indicator is the best representative of mixed stock fishery mortalities in Green River and Lake Washington of those listed as part of the Puget Sound Natural Summer/Falls stock group in Attachment IV and V. However, because of directed terminal fisheries on the two components of SPS indicator, the SPS stock is not suitable for assessing these fishery types. In addition, because stocks originating in South Puget Sound are exposed to a higher level of mark-selective fishing, exploitation rates measured from marked tag recoveries will likely overestimate the impacts on unmarked natural stocks. The NIS and SPY stocks are the southernmost indicator tag groups in Puget Sound. The SPY indicator represents hatchery production where the intent of the program is to release yearling Chinook salmon that have a higher tendency to remain within Puget Sound and benefit the Puget Sound sport fishery. This hatchery program has been reduced substantially since Chinook salmon were listed in 1999 as threatened status under the U.S. Endangered Species Act. The WRY indicator has not been adipose clipped since the 2002 BY and all tag recoveries result from electronic tag detection sampling. The migration range of WRY is almost exclusively within the Salish Sea where all fisheries are sampled with electronic tag detectors.

2.2.8.3.1 Brood Year Exploitation Rates

The ocean fishery BYER for SPS has ranged between a high of 73% for the 1975 BY to a low of 23% for the 1995 BY (Figure 2.38). The relatively high BYER for SPY reflects the intent of full harvest on this hatchery stock with achievement of egg-take goals as the only escapement objective. The 1980 BYER for NIS and WRY were in the vicinity of 50–70%. Since 2000, BYERs averaged 27% for NIS and 15% for WRY (Figure 2.39). A total fishery BYER for SPS and NIS would

include additional mortalities from inriver fisheries that can be significant for these indicators.

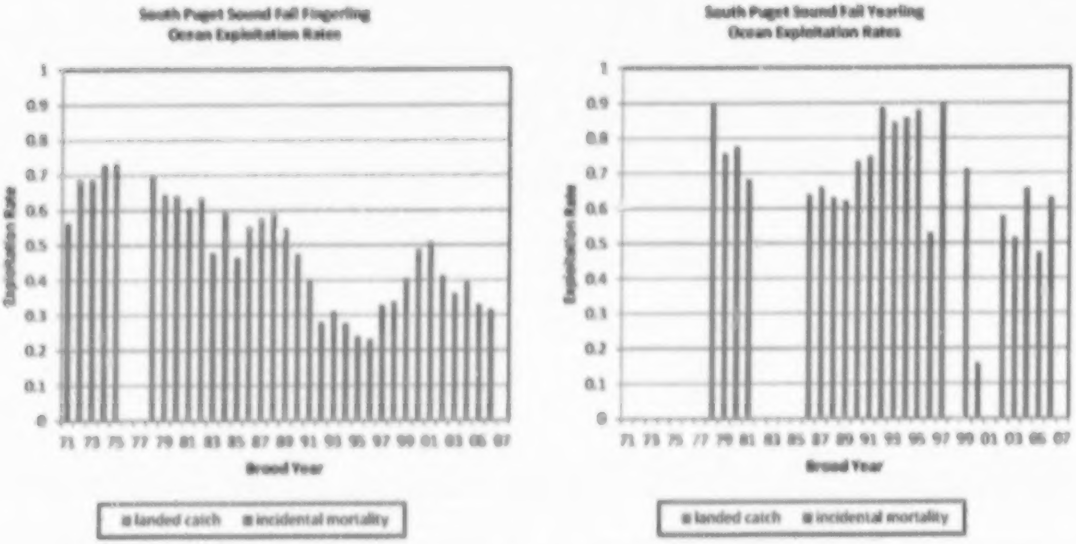


Figure 2.38 Brood year exploitation rate in terms of landed catch and incidental mortality for South Puget Sound Fall Fingerling and Yearling indicator stocks.

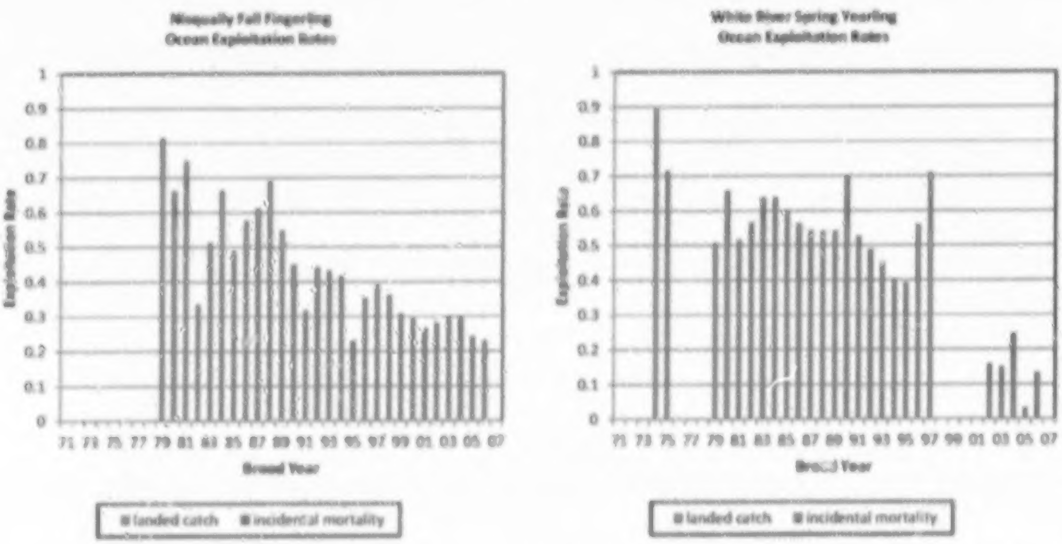


Figure 2.39 Brood year exploitation rate in terms of landed catch and incidental mortality for Nisqually Fall Fingerling and White River Spring Yearling CWT indicator stocks.

2.2.8.3.2 Survival Rates

Survival rates from release to age 2 for SPS ranged from a low of 0.5% for 1980 BY to a high of 9.5% for 1975 BY (Figure 2.40). With the exception of the 1985 BY where the survival rate was 15%, the rates for SPY have been low and often less than 1% (Figure 2.41). Survival for NIS ranged from a low of 0.1% for 1987 BY to a high of 4.5 % for 2004 BY (Figure 2.42). Survival for

WRY ranged from a low of 0.04% for 1975 BY to a high of 15.4% for the 1985 BY (Figure 2.43). The survival index and the EV was poorly correlated for SPS with Pearson correlation coefficient of 0.32 and not correlated for SPY (r = 0.01) or WRY (r = 0.13).

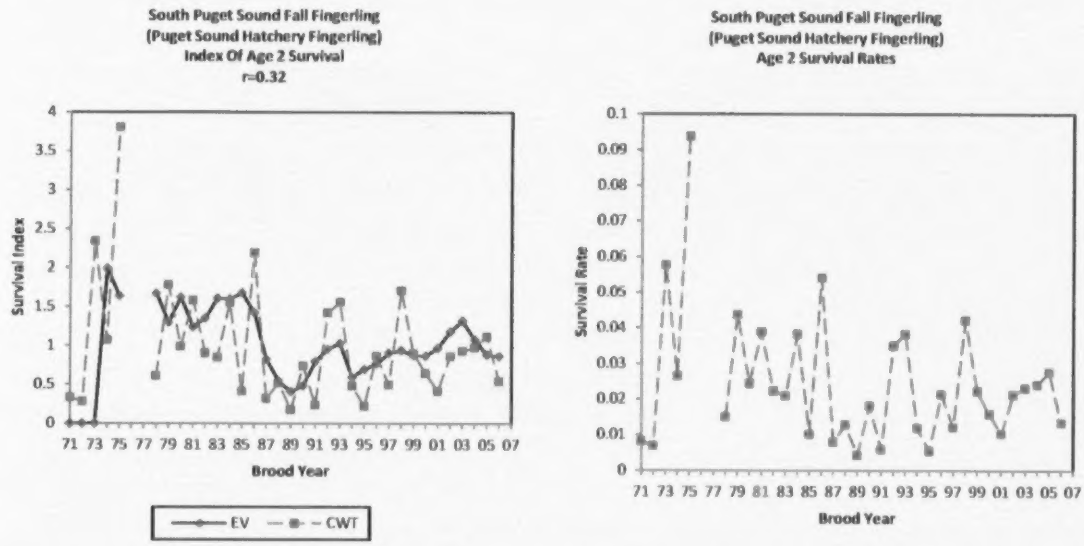


Figure 2.40 CWT survival and EV indices and survival rate for South Puget Sound Fall Fingerling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

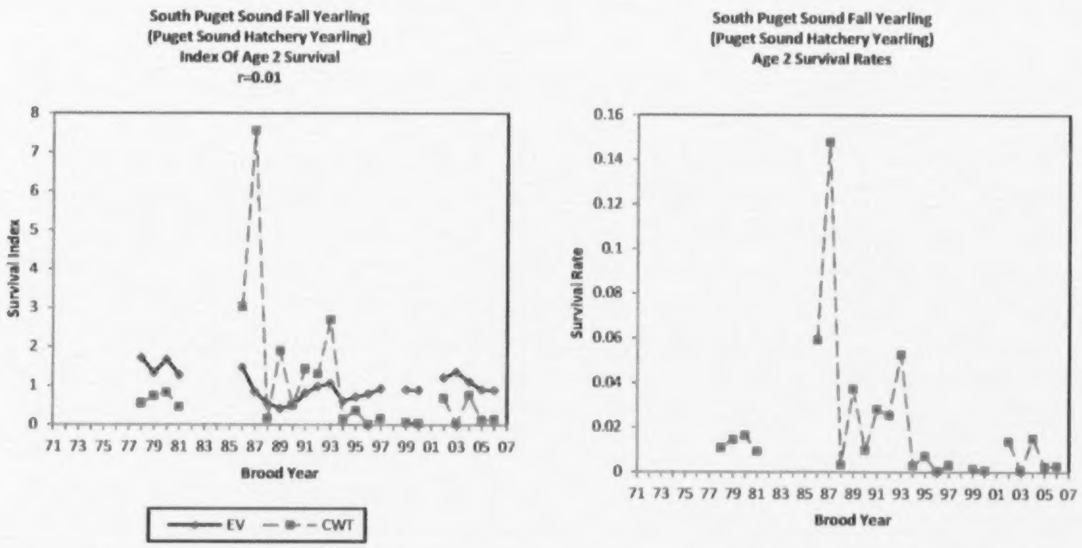


Figure 2.41 CWT survival and EV indices and survival rate for South Puget Sound Fall Yearling stock. r: Pearson correlation coefficient between CWT and EV survival indices.

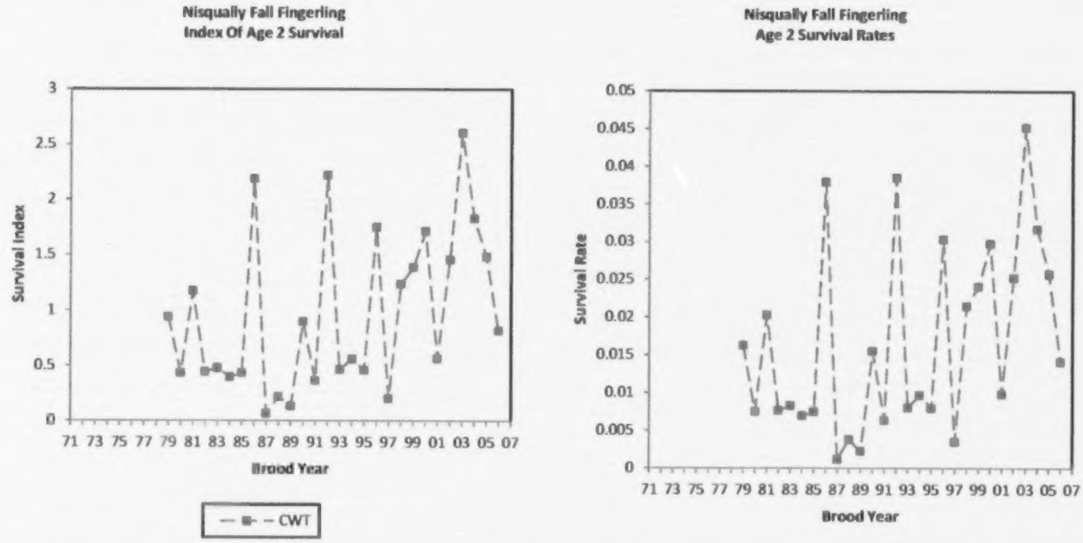


Figure 2.42 CWT survival index and survival rate for Nisqually Fall Fingerling stock.

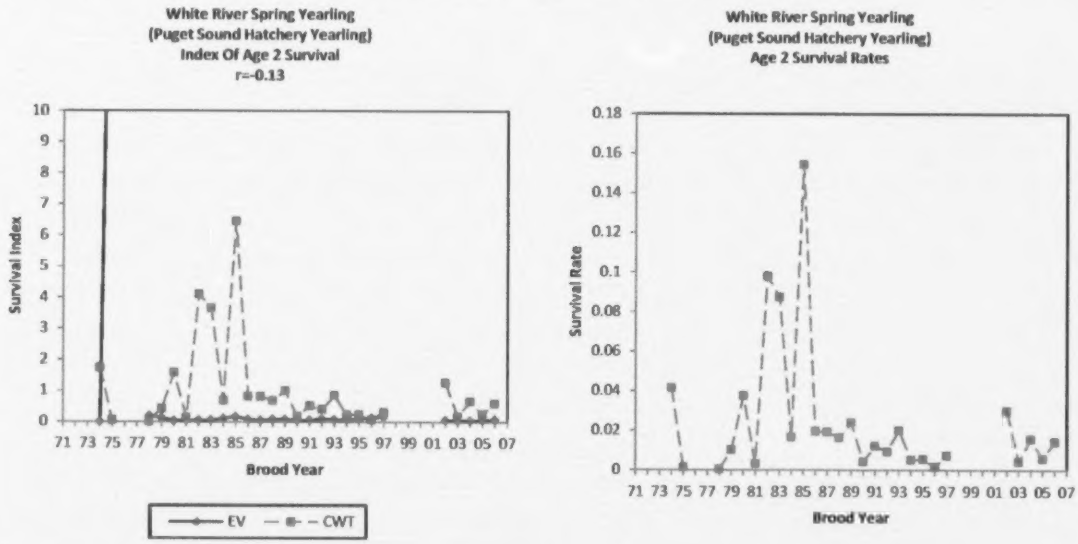


Figure 2.43 CWT survival index and survival rate for White River Spring Yearling stock.

2.2.8.3.3 Mortality Distributions

Percent distribution in total AEQ fishery mortality for the South Puget Sound stocks during 1999–2011 averaged 36% for SPS (Figure 2.34; Appendix C36), 79% for SPY (Figure 2.34; Appendix C37), 66% for NIS (Figure 2.34; Appendix C22) and 25% for WRY (Figure 2.34; Appendix C45). The fishery mortality distribution for SPS and NIS north of the U.S. and Canada border is similar to the other Puget Sound Fall Fingerling stocks, with a very low percentage (<0.5%) in SEAK and much higher rates (approximately 14%), in Canadian fisheries (primarily WCVI). The fall fingerling stocks (SPS and NIS) have a higher mortality in Puget Sound fisheries than the North and Central Puget Sound indicators. The higher rates are the result of exposure

to mark-selective sport fisheries throughout Puget Sound and to significant terminal net fisheries in most years that can target large-scale hatchery production. Fishing mortality for WRY is predominantly within Puget Sound.

During 1999–2011, the distribution of fishing mortality for SPS and NIS has remained stable. Fisheries north of the U.S. and Canada border comprised approximately 14% in 1999–2003 and 12% in 2007–2011. Fisheries south of the U.S. and Canada border comprised 46% in 1999–2003 and 42% in 2007–2011. Corresponding to these fisheries, the percentage in escapement was 40% in 1999–2003 and 46% in 2007–2011.

2.2.8.4 *Juan De Fuca and Hood Canal*

Tagging of Elwha River (ELW) Fall Fingerling stock in Juan de Fuca was discontinued with the 1994 BY. A hatchery program continues using brood stock collected from the spawning grounds and to the hatchery rack. The Elwha Hatchery program has now shifted to a stock restoration and recovery program with the removal of the Elwha River dams that began in September 2011. Marking and tagging of this stock resumed with the 2012 BY as part of monitoring and evaluation of the restoration project. The George Adams (GAD) stock indicator is used to represent fishery and escapement distribution of natural fall fingerlings in Hood Canal tributaries, primarily the Skokomish River at southern end of Hood Canal.

2.2.8.4.1 Brood Year Exploitation Rates

For the BYs available for ELW, the ocean fishery BYER ranged from a high of 78% for BY 1989 to a low of 38% for the 1992 and 1993 BYs (Figure 2.44). The BYER for GAD ranged from a high of 80% in 1989 to a low of 23% in 1994 (Figure 2.44). A total fishery BYER for GAD would include additional mortality associated with the significant river fisheries that occur in most years.

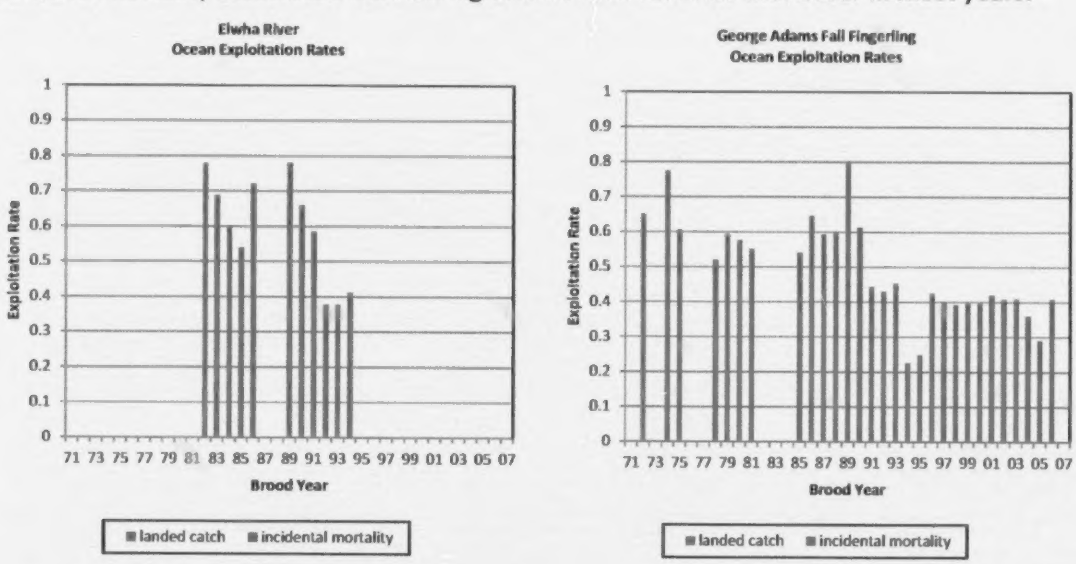


Figure 2.44 Brood year exploitation rate in terms of landed catch and incidental mortality for Elwha and George Adams (Skokomish River) Fall Fingerling CWT indicator stocks.

2.2.8.4.2 Survival Rates

Survival rates of ELW were initially approximately 2% in the first three years of tagging (1982–1984), plummeted in 1985 to less than 1%, and remained there until the program was discontinued (Figure 2.45). Survival rates for GAD averaged 1.2% during 1985–2006, and ranged from a low of 0.04% for BY 1990 to a high of 6.3% for BY 1978 (Figure 2.46).

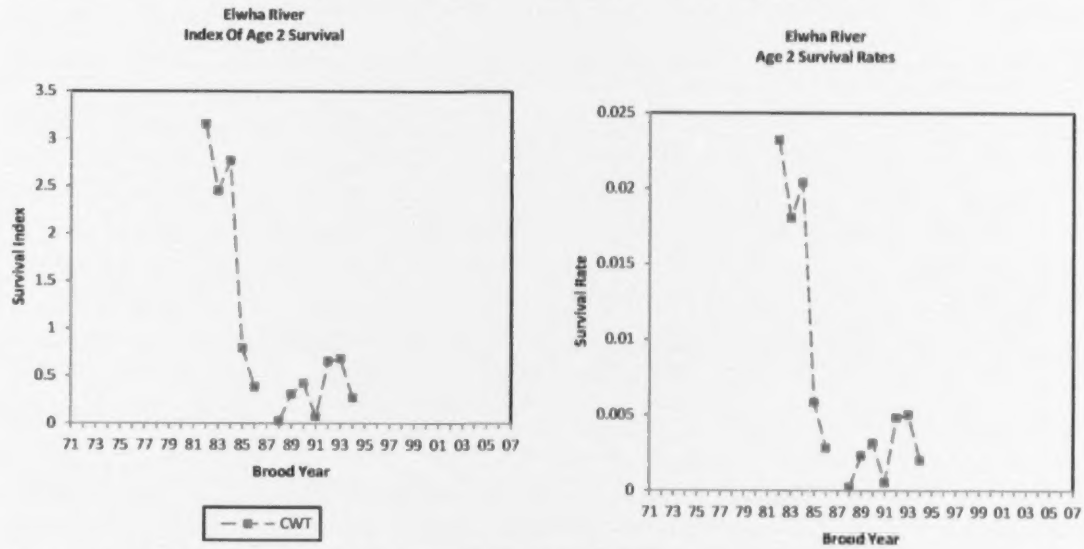


Figure 2.45 CWT survival index and survival rate for Elwha River stock.

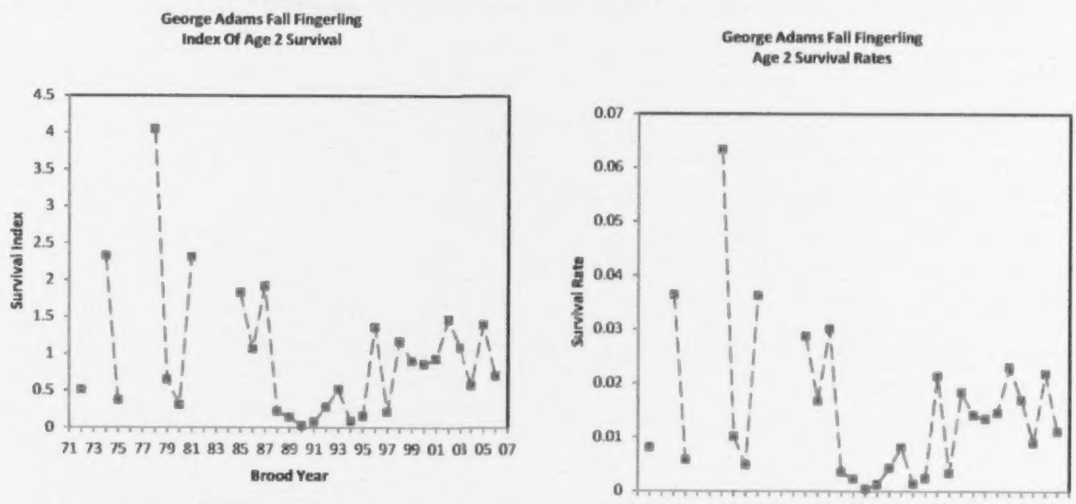


Figure 2.46 CWT survival index and survival rate for George Adams (Skokomish River) Fall Fingerling stock.

2.2.8.4.3 Mortality Distributions

The last year of data for measuring percent distribution in total AEQ fishery mortality for ELW is 1997 (Figure 2.34; Appendix C10). During 1986–1997, fisheries in Alaska comprised 9% of the

mortality, Canada 32%, Washington and Oregon coast 3%, and Puget Sound 23%, primarily in the Juan De Fuca sport fishery. Escapement of ELW averaged 36% during this period. For GAD during 1999–2011, fisheries in Alaska comprised 1% of the fishery and escapement distribution, Canada 19%, Washington and Oregon coast 5%, and Puget Sound 29% (Figure 2.34; Appendix C11). Escapement of GAD during 1999–2011 averaged 46%.

Distribution of fishing mortality for GAD during 1999–2011 between Alaska, Canada and the southern U.S. was shifted slightly by a reduction in fisheries north of the U.S. and Canada border from 22% during 1999–2003 to 14% during 2007–2011. Fisheries mortality percentage south of the U.S. and Canada border has increased from an average of 32% during 1999–2003 to 40% during 2007–2011. Escapement of GAD is unchanged between the beginning and ending five-year period of 1999–2011.

2.2.8.5 *Regional Summary for Washington Salish Sea Stocks*

For Washington Salish Sea stocks, BYER is measured in terms of ocean mortality only because terminal fisheries may not properly reflect the impacts on the natural stock represented by the CWT indicator. Some terminal fisheries are designed as hatchery fish target zones which would exceed the impacts on any natural stocks in the basin. Additionally, some river sport fisheries are now managed under mark-selective regulations that likely overestimate impacts on natural stocks. The ocean fishery BYERs contain estimates of exploitation in the Puget Sound marine area mark-selective sport fisheries which have grown significantly since 2003. Consequently, these BYERs for Puget Sound stocks, especially those from central and southern Puget Sound will tend to overestimate the exploitation relative to that of the natural stocks they are intended to represent. Therefore, because of the exclusion of terminal fisheries and the inclusion of Puget Sound marine area MSFs, the ocean fishery BYERs for Washington Salish Sea stocks will not reflect total fishery impacts on natural stocks.

The BYERs for Washington Salish Sea Stocks averaged 38% (per stock average range of 30–45%) for the fall fingerling stocks (SAM, SSF, STL, SKY, SPS, NIS, ELW, and GAD) and 37% (range 28–42%) for the spring fingerling and yearling stocks (NSF, NKS, SKF, SKS, and WRY; Table 2.9). Comparing the mean BYER to the rate in the last complete BY, the BYER was higher in the last complete BY for only one of the fall fingerling stocks (SSF) and two of the spring stocks (NKF and NKS).

Survival rates to age 2 for Washington Salish Sea Stocks were typically 1–3% for most indicators and similar to the rates commonly observed for fall-run fingerling type stocks (Table 2.9). Survival rates to age 3 for spring-run yearling stocks were 1.1–2.85%, and were at the lower end of rates usually observed for yearling type releases that should accrue some survival benefit from an extra year of rearing in the hatchery. The trend in survival rates for those stocks with a long continuous time series of analysis (e.g., SAM, SPS, GAD) shows the lowest survival rates occurring for the late 1980s to early 1990s broods with somewhat improved survivals beginning in the early 2000s.

Calendar year escapement for fall fingerling stocks varies between the stocks with significant terminal fisheries that have average escapements of 25–46% (SAM, SPS, NIS, and GAD) to stocks that do not have significant terminal fisheries where escapement is 60–66% (SSF, STL, and SKY; Table 2.9). The mean escapement for spring stocks has ranged from 48% for SKY to

75% for WRY. Relative to the average escapement during 1999–2011, the escapement in the last calendar year is higher for SAM, SPS, NIS Fall Fingerling stocks and WRY Spring stock.

Table 2.9 Summary of statistics generated by the 2011 CWT cohort analysis for Washington Salish Sea indicator stocks by region. Statistics include total ocean fishery mortality (adult equivalent catch plus incidental mortality) brood year exploitation rate (BYER), cohort survival rate to age 2, and calendar year (CY) percent distribution in the escapement.

							CY % Escapement[1]		
			BYER (total mortality)		Survival rate		1999–2008	2009–present	
Subregion	Stock Abbrev.	Indicator Stock Name	Mean (range)	Last complete BY	Mean (range)	Last complete BY	Mean (range)	Mean (range)	Last CY (if ≠ current)
North Puget Sound	NSF	Nooksack Spring Fingerling[2]	41% (25–63%)	42%	1.40% (0.3–4.5%)	0.70% (2006)	55% (37–81%)	52% (50–55%)	50%
	NKS	Nooksack Spring Year[2]	50% (29–76%)	44%	1.10% (0.1–3.7%)	0.60% (1996)	60%	–	–
	SAM	Samish Fall Fingerling[2]	44% (29–67%)	29%	2.80% (0.3–15.1%)	0.70% (2006)	23% (13–31%)	30% (27–37%)	27%
	SKF	Skagit Spring Fingerling[2]	30% (13–49%)	13%	1.70% (0.7–4.3%)	1.30% (2006)	63% (46–78%)	53% (47–58%)	58%
	SKS	Skagit Spring Yearling[2]	44% (2[illegible]–77%)	20%	2.80% (0.6–7.5%)	1.70% (2006)	51% (31–68%)	39% (39–40%)	39%
	SSF	Skagit Summer Fingerling[2]	29% (21–39%)	25%	1.30% (0.2–3.4%)	0.80% (2006)	64% (54–76%)	46% (33–60%)	46%
Central Puget Sound	STL	Stillaguamish Fall Fingerling[2]	50% (22–90%)	26%	1.80% (0.3–6.4%)	0.40% (2006)	68% (45–83%)	61% (55–64%)	64%
	SKY	Skykomish Fall Fingerling[2]	35% (22–43%)	22%	0.90% (0.4–1.9%)	0.50% (2006)	61% (56–75%)	67% (54–78%)	54%
South Puget Sound	SPS	South Puget Sound Fall Fingerling[2]	49% (23–73%)	32%	2.40% (0.4–9.4%)	1.30% (2006)	50% (34–70%)	58% (49–67%)	59%
	SPY	South Puget Sound Fall Yearling[2]	69% (16–90%)	63%	2.00% (0.03–14.8%)	0.30% (2006)	19% (2–47%)	24% (1–56%)	1%
	NIS	Nisqually Fall Fingerling[2]	44% (23–81%)	23%	1.70% (0.1–4.5%)	1.40% (2006)	31% (11–56%)	44% (35–55%)	55%
	WRY	White Spring Yearling[2]	50% (3–89%)	13%	2.50% (0.04–15.4%)	1.40% (2006)	67% (48–84%)	88% (83–94%)	94%
Juan de Fuca/Hood Canal	ELW	Elwha[2]	59% (38–78%)	41%	0.70% (0.02–2.3%)	0.20% (1994)	–	–	–
	GAD	George Adams Fall Fingerling[2]	49% (23–80%)	41%	1.50% (0.04–6.3%)	1.10% (2006)	46% (37–63%)	46% (40–51%)	46%

[1] % Escapement is not a measure of performance for the escapement indicator stock(s) associated with a given CWT indicator stock. See CTC (2013) for these details.

[2] BYER is ocean exploitation rate only.

2.2.9 Columbia River Stocks

The Columbia River stocks are split into those from the Lower Columbia, the Upper Columbia, the Snake River tributary, and the Willamette River tributary. There are four fall Chinook CWT

indicator stocks for the Lower Columbia River: Columbia Lower River Hatchery Tule (LRH, released recently from Big Creek/Bonneville Hatchery), Cowlitz Hatchery Tule (CWF), Spring Creek Hatchery Tule (SPR), and Lewis River wild bright (LRW). There are two fall and one summer Chinook CWT indicator stocks for the Upper Columbia River: Columbia Upriver Bright fall Chinook (URB, from Priest Rapids Hatchery), Hanford Wild Bright fall Chinook (HAN, from Hanford Reach), and Columbia Summers (SUM, from Wells Hatchery, includes fingerlings and some yearling releases). There is one fall Chinook CWT indicator stock for the Snake River tributary, Lyons Ferry Hatchery Bright. These enter the ocean as a combination of fingerlings and yearlings; the fingerlings (LYF) are employed in this analysis. A single spring Chinook indicator stock originates in the Willamette River tributary (WSH). Juveniles are released primarily as yearlings by the Oregon Department of Fish and Wildlife from several Willamette basin hatcheries. Despite differences in outmigration age, age 2 is the youngest age recovered for all the Columbia River stocks. The CWT time series begins with the following BYs: 1975 for SUM, URB and WSH; 1976 for LRH; 1977 for CWF, LRW, and SPR; 1984 for LYF; and 1986 for HAN. The time series for LRW and LYF were interrupted by missing BYs (either no adipose fin clipped releases or no subyearling releases).

2.2.9.1 *Brood Year Exploitation Rates*

There were several general patterns in the BYER computed for Columbia River Stocks (Figure 2.47; Table 2.10). For all except CWF and WSH, BYERs include recoveries from both ocean and terminal fisheries; CWF and WSH Chinook experience different terminal harvest impacts than their wild counterparts.

The three hatchery stocks in the lower Columbia River (CWF, LRH, and SPR) showed decline in BYER from highs during the late 1970s (CWF: 65% for 1977; LRH: 83% for 1976; SPR: 93% for 1973) to lows during the early to mid-1990s (CWF: 11% for 1991; LRH: 19% for 1993; SPR: 48% for 1995) with recent BYERs in between the two extremes. Average BYERs were 39% for CWF, 58% for LRH, and 72% for SPR. Incidental mortality rates averaged 7% (CWF), 10% (LRH), and 12% (SPR) of the total BY return, with ranges 3–11% (CWF), 3–23% (LRH), and 6–17% (SPR). The percentage of the BYER (landed catch + IM) that was estimated as IM averaged 19% (CWF: range 8–51%), 18% (LRH: range 9–32%), and 17% (SPR: range 12–22%) of total fishing mortality. For LRH, but not the two other stocks, IM appears to have declined substantially in recent years (average of 19% of BYER through 1998 versus 13% since 1999).

The LRW bright stock in the lower Columbia River and SUM stock in the upper Columbia River also experienced decline to particularly low BYERs in the 1990s (lowest were 16% for LRW in 1996, and 21% for SUM in 1992 and 1993), followed by increase to rates similar to those before the 1990s. For LRW the highest BYER was observed in 2007 (69%), and for SUM the highest BYER was observed in 1998 (74%). Average BYERs were 43% for LRW and 52% for SUM. Incidental mortality averaged 7% (range 2–10%) for LRW and 7% (range 3–14%) for SUM, as a percentage of the total BY return. As a part of BYER, IM averaged 16% for LRW (range 9–35%) and 15% for SUM (range 7–36%). Incidental mortality did not appear to show a trend over time for LRW, but for SUM it appeared to be somewhat greater up to 1998 (17%) than afterwards (12%).

A somewhat similar pattern to that for LRW and SUM was observed for URB upriver bright

hatchery stock, except the URB BYERs reached low levels in the late 1970s (low of 24% in 1978) and highest levels in the 1980s (high of 81% in 1984). The overall average BYER was 56%. Incidental mortality ranged from 5–18%, averaging 9% of the total BY return. Incidental mortality made up an average of 17% of total fishing mortality in BYERs (range 10–45%), and it did not appear to show any time trend.

Releases of CWT fish for HAN (an upriver bright wild stock like URB) began with the 1984 BY, and BYERs decreased fairly steadily through the late 1990s, increased rapidly through the mid-2000s, and then decreased again. The lowest BYER was 42% in 1998, the highest was 78% in 2004, and the average was 57%. Incidental mortality ranged from 3–11% and averaged 8% of the total returns and 14% of total fishing mortality (range from 7–21%), and did not appear to have a trend over the time series.

Releases of CWT fish for LYF began with the 1984 BY, and BYERs decreased fairly steadily through the 1990s, then mostly increased through the 2000s. The lowest BYER was 30% in 2004, the highest was 80% in 2007, and the average was 49%. Incidental mortality ranged from 6–14% and averaged 9% of the estimated total return, and averaged 19% of the total fishing mortality (range 13–37%), and did not appear to have a trend over the time series.

Although BYERs were multimodal for WSH, a spring stock on the Willamette River (Figure 2.48), almost all values for the 1970s and 1980s were higher than those for the 1990s and 2000s. But compared to the summer and fall run stocks, the entire time series of BYERs for this spring run stock were substantially lower. The highest BYER was observed for the 1983 BY (29%), the lowest for the 2004 BY (3%), and the average was 12%; only the Taku (10%) and Chilkat (11%) stocks, also spring run, have similarly low contribution rates to ocean fisheries. Incidental mortality for WSH ranged from 1–6%, averaging 3% of the total return, but was relatively high, averaging 27% of the estimated total fishing mortality. Also, IM appeared to be marginally higher in years up to 1998 (29% of BYER) than afterwards (23% of BYER).

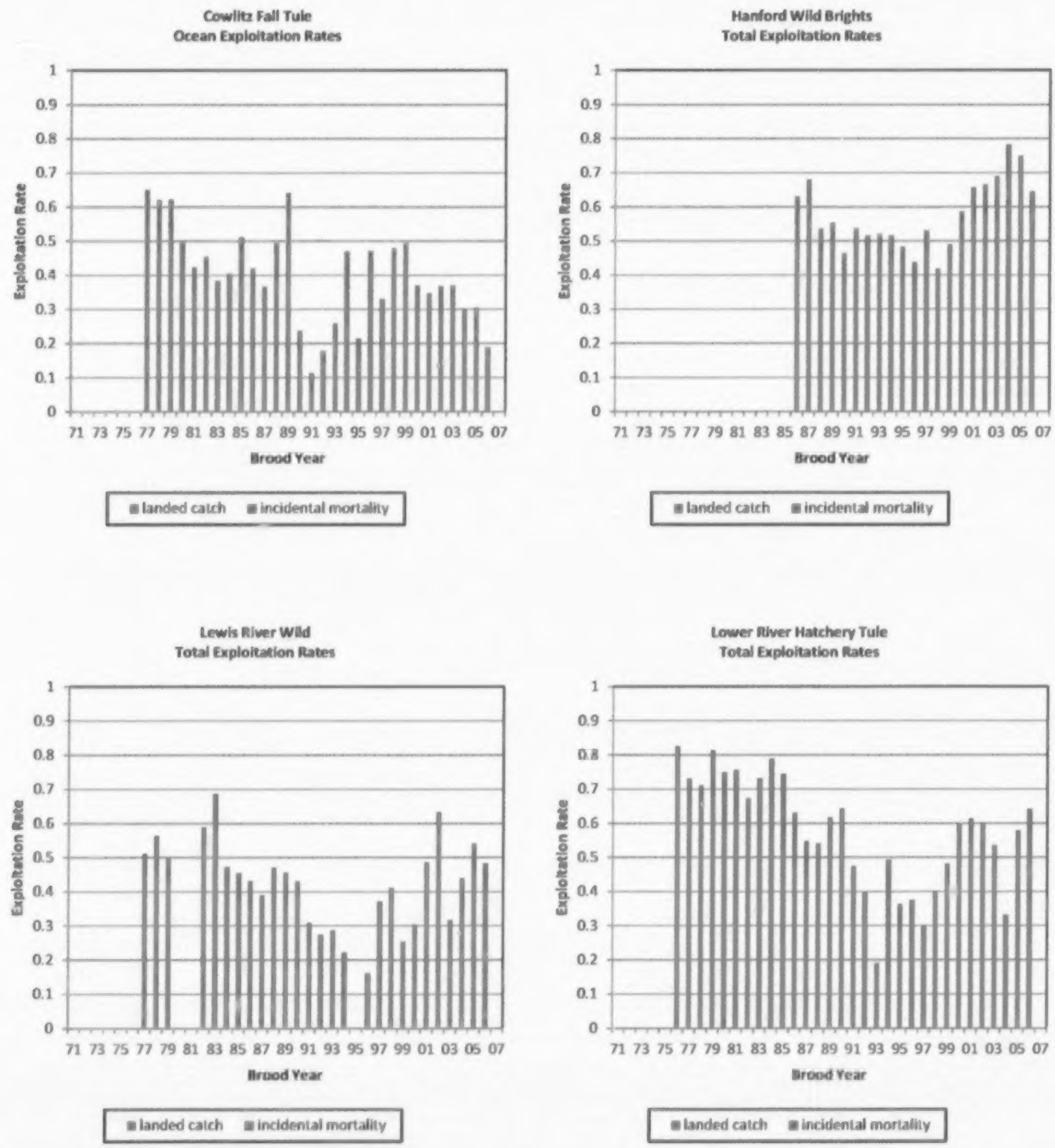
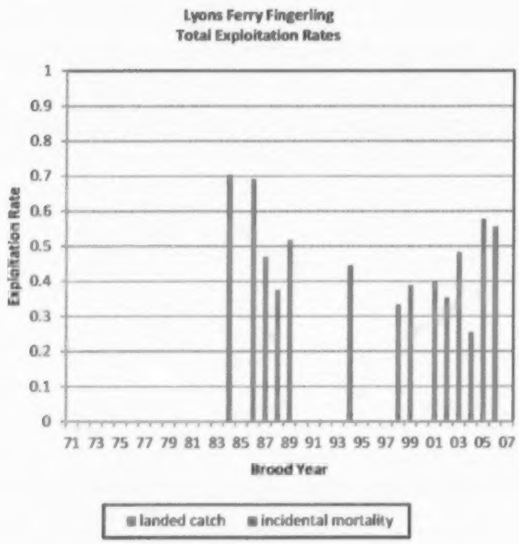
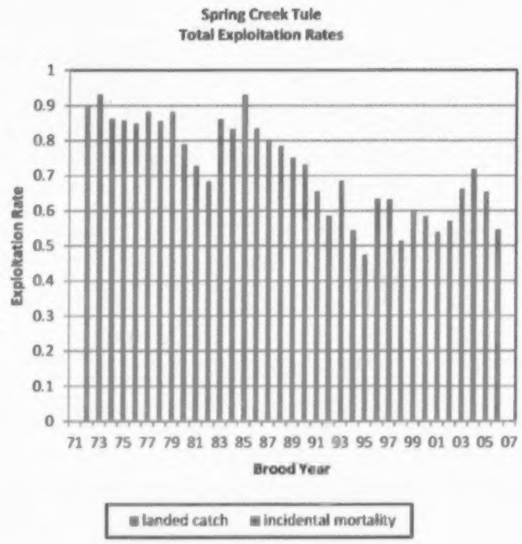
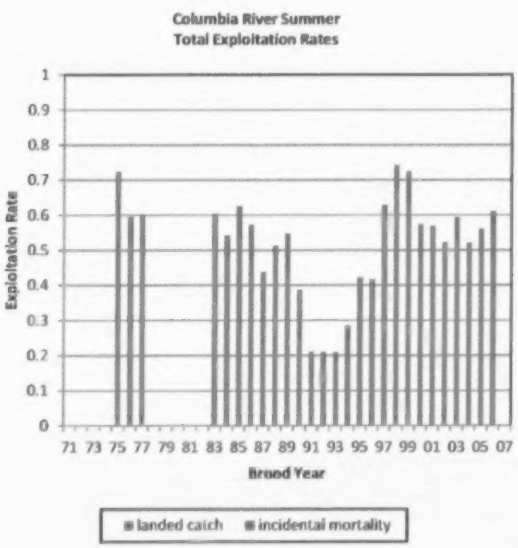


Figure 2.47 Brood year exploitation rate for summer and fall Columbia River Stocks. Catch and incidental mortality are shown. Only completed brood years are included.







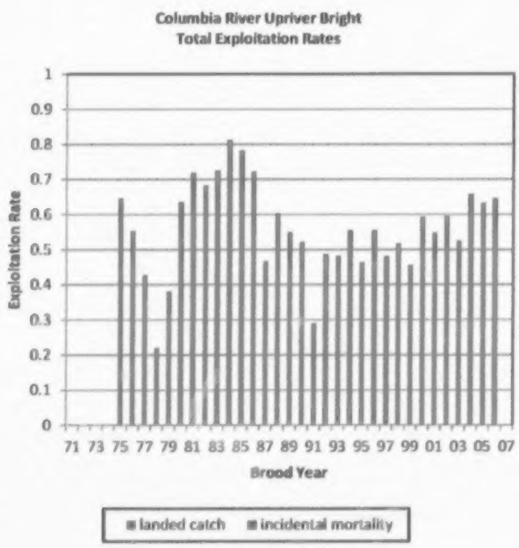


Figure 2.47 Page 2 of 2.

Table 2.10 Summary of statistics generated by the 2012 CWT cohort analysis for Columbia River indicator stocks. Statistics include total mortality (catch plus incidental mortality) brood year exploitation rate (BYER), cohort survival rate to age 2, and calendar year (CY) percent distribution of the total mortality in the escapement for Agreement periods 1999–2008 and 2009–present.

		BYER (total mortality)		Survival rate		CY % Escapement[1]		
						1999–2008	2009–present	
Stock Abbrev	Indicator Stock Name	Mean (range)	Last complete BY	Mean (range)	Last complete BY	Mean (range)	Mean (range)	Last CY (if ≠ current)
CWF	Cowlitz Fall Tule[2]	40% (11–65%)	19%	0.6[illegible]% (0.06–3.56%)	0.67% (2006)	52% (25–68%)	73% (64–90%)	90%
HAN	Hanford Wild Brights	58% (42–78%)	64%	1.09% (0.19–4.42%)	0.59% (2006)	44% (28–56%)	31% (11–46%)	36%
LRH	Lower River Hatchery Tule	58% (19–83%)	64%	1.13% (0.02–9.48%)	0.47% (2006)	52% (38–70%)	32% (27–40%)	40%
LRW	Lewis River Wild	42% (16–69%)	48%	2.23% (0.22–6.96%)	0.61% (2006)	58% (39–81%)	46% (32–64%)	32%
LYF	Lyons Ferry Fingerling	47% (25–70%)	56%	1.18% (0.08–4.05%)	0.27% (2006)	54% (40–74%)	21% (13–37%)	13%
SPR	Spring Creek Tule	72% (48–93%)	54%	1.98% (0.13–8.47%)	0.44% (2006)	38% (30–50%)	33% (27–42%)	27%
SUM	Columbia Summer	52% (21–74%)	61%	1.33% (0.07–4.84%)	0.47% (2006)	42% (28–59%)	45% (38–52%)	38%
URB	Columbia River Upriver Bright	56% (22–81%)	65%	1.98% (0.09–7.56%)	0.14% (2006)	47% (40–62%)	42% (31–57%)	40%
WSH	Willamette Spring Hatchery[2]	12% (3–29%)	5%	3.0% (0.6–7.4%)	1.6% (2005)	64% (51–73%)	53% (43–60%)	43%

[1] % Escapement is not a measure of performance for the escapement indicator stock(s) associated with a given CWT indicator stock. See CTC (2013) for these details.

[2] BYER is ocean exploitation rate only.

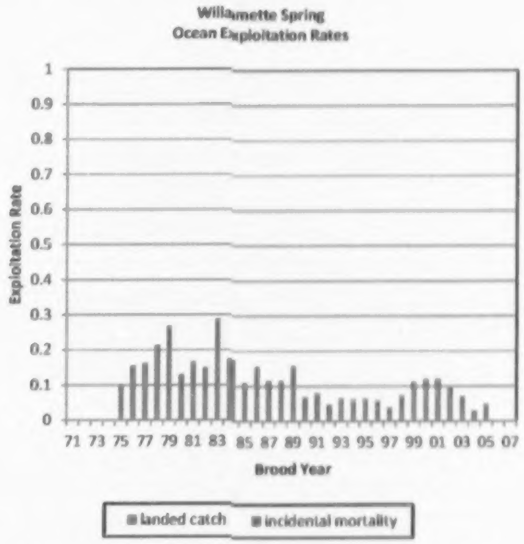


Figure 2.48 Brood year exploitation rate for Willamette Spring Chinook. Catch and incidental mortality are shown. Only completed brood years are included.

2.2.9.2 *Survival Rates*

There appears to be an increasing trend in relative survival during the recent years for the SUM stock, but for the other Columbia River fall Chinook stocks, it is difficult to discern any pattern other than variability over time (Figure 2.49). There is some correlation between the EV index from the Chinook Model and the survival index from CWT recovery analysis for some Columbia River fall Chinook stocks, particularly for the CWF, LRH and SPR stocks.

The survival rate of Willamette Spring Chinook, from release to age 3 (i.e., due to the stock's entry into the ocean as yearlings) has varied widely across the last 30 BYs (Figure 2.50). WSH survival rates have averaged around 3% and ranged from 0.6–7.4%. The most recently complete BY registered a 1.6% survival rate. The EV and survival index are weakly correlated with r = 0.32.

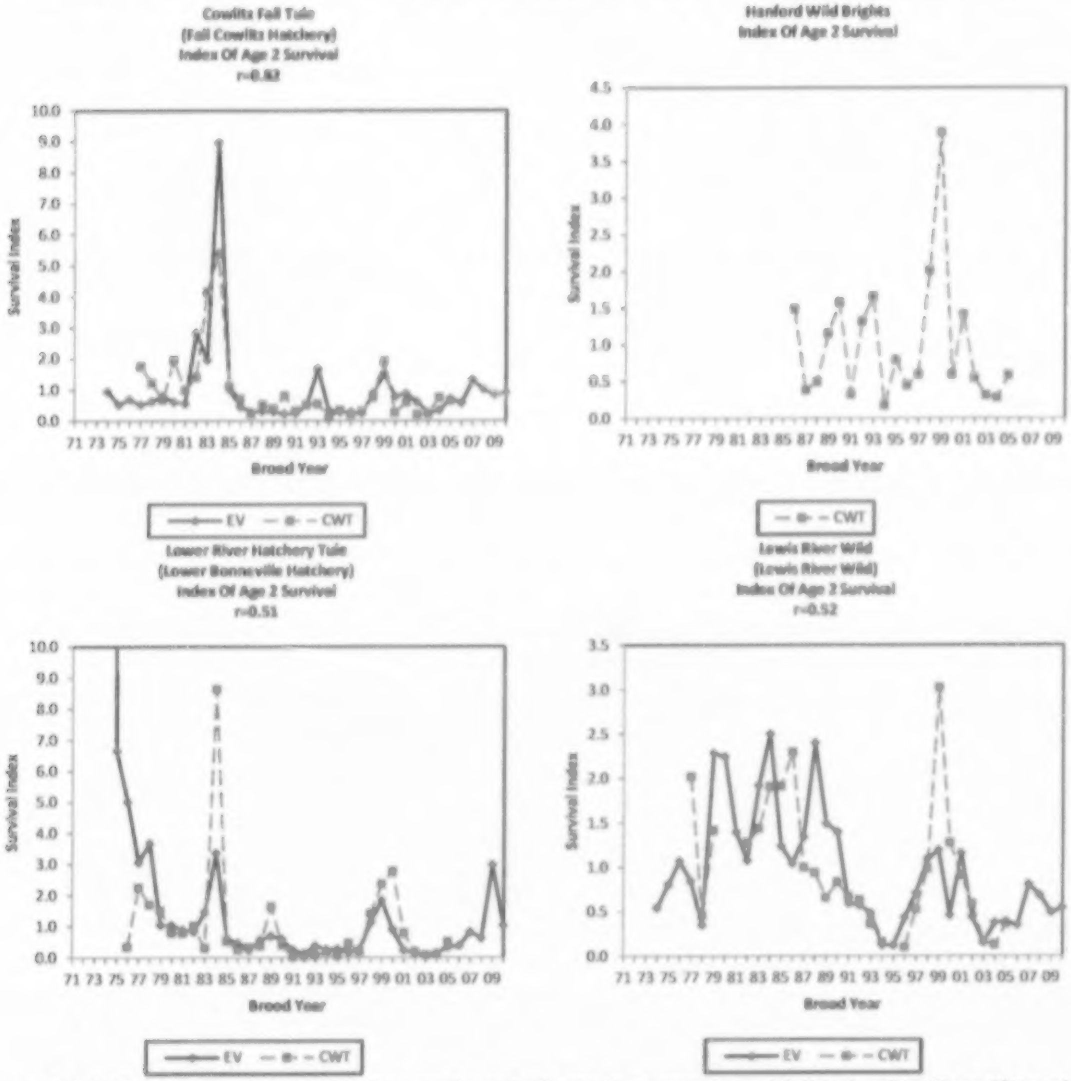


Figure 2.49 CWT survival and EV indices and survival rate for summer and fall Columbia River Chinook stocks. r: Pearson correlation coefficient between CWT and EV survival indices.

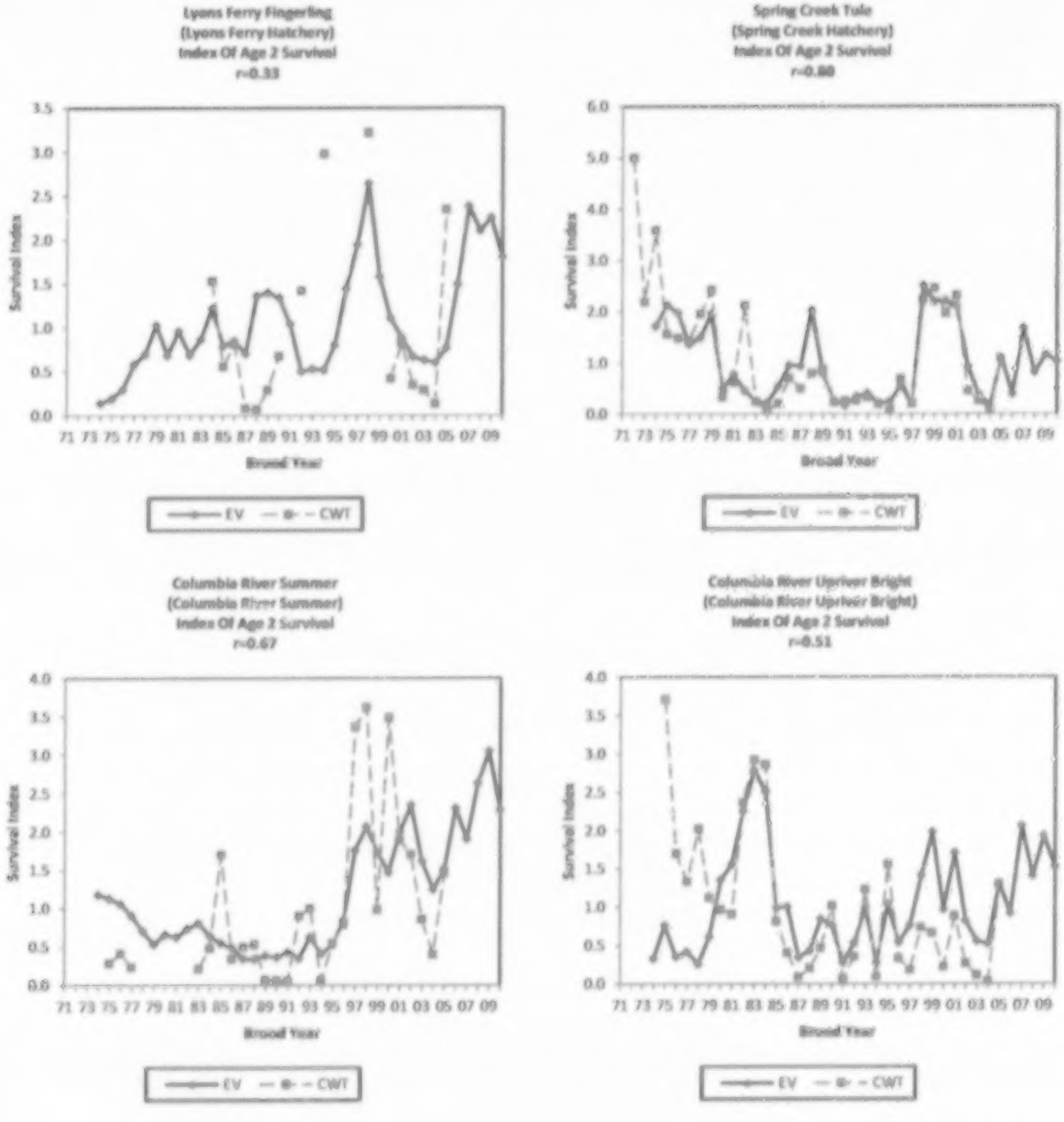


Figure 2.49 Page 2 of 2.

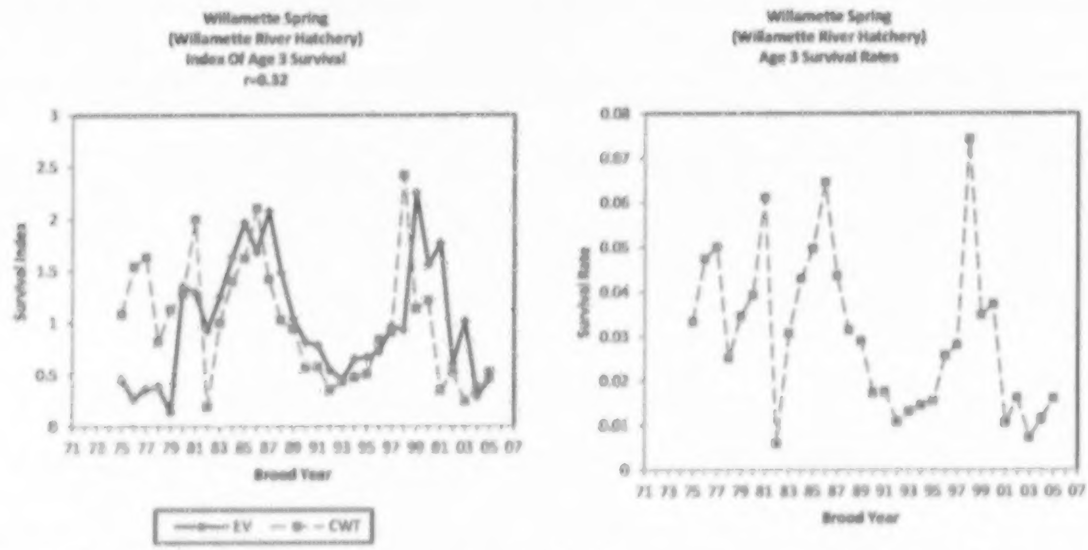


Figure 2.50 CWT survival and EV indices and survival rate for the Willamette River Spring Chinook indicator stock. r: Pearson correlation coefficient between CWT and EV survival indices.

2.2.9.3 *Mortality Distributions*

For the Cowlitz Fall Tule CWF stock, escapement generally made up a slightly greater proportion of total mortality than did fisheries impacts. Since the 1999 PST Agreement, the escapement was larger during the recent time period (56.5%, 1999–2011) than it was during the long-term time period (51.4%, 1981–2011). Most of the catch in the recent average was distributed among four fisheries: 12.2% WA/OR Coast troll, 6.8% WA/OR Coast sport, 5.4% terminal sport, and 5.3% WCVI troll. In the long-term average distribution, terminal net had a larger impact than terminal sport: 11.2% WA/OR Coast troll, 8.7% WCVI troll, 6.1% terminal net, 5.8% WA/OR Coast sport, and 4.6% terminal sport. During 1979–1984, WCVI Troll, WA/OR Coast sport and terminal net had considerably greater impacts: 19.4% WCVI troll, 10.4% WA/OR Coast sport, and 10.1% terminal net. Details on the smaller fisheries can be found in Appendix C7. Please refer to Figure 2.51 for a graphical display of mortality distribution results for CWF and remaining stocks.

For the upriver bright wild HAN stock, escapement generally made up a smaller proportion of total run than did fisheries impacts. Escapement was slightly higher during the recent time period (42.8%, 1999–2011) than it was during the long-term time period (41.1%, 1990–2011). Most of the catch in the recent average was distributed among three fisheries: 17.6% terminal net, 16.6% SEAK troll, and 8.3% terminal sport. The long-term average was similar but SEAK troll had the biggest impact: 18.0% SEAK troll, 17.8% terminal net, and 9.8% terminal sport. During 1985–1995, WCVI troll also had significant impacts (7.1%). Details on the smaller fisheries can be found in Appendix C12.

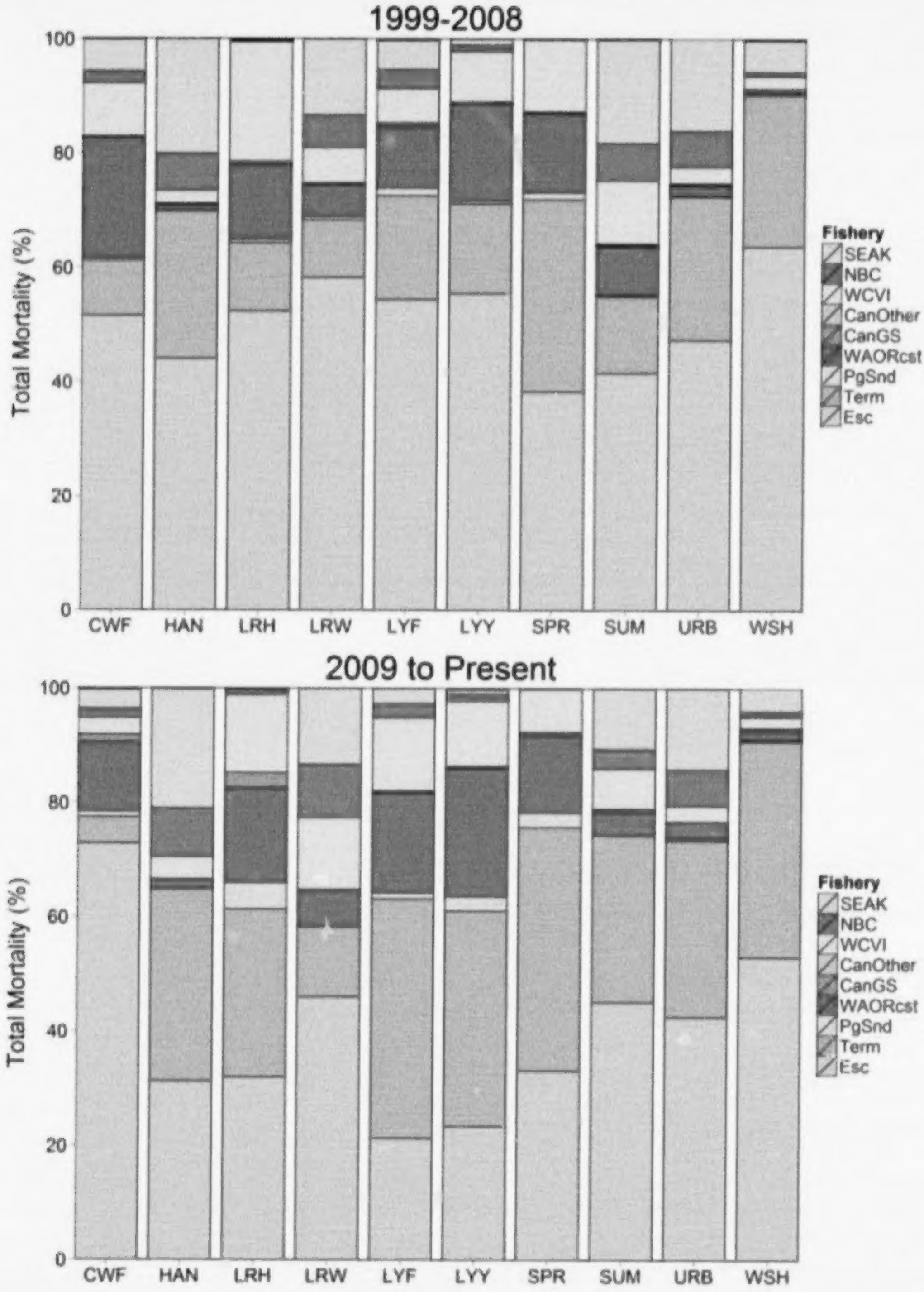


Figure 2.51 Distribution of total mortality for Columbia River indicator stocks for the current (2009–present) and previous (1999–2008) agreement periods.

For the Lower River Tule LRH stock, escapement generally made up a somewhat smaller percentage of total run than did fisheries impacts. Escapement was higher during the recent time period (47.7%, 1999–2011) than it was during the long-term time period (43.4%, 1979–2011. Most of the catch in the recent average was distributed among four fisheries: 13.2% terminal net, 12.0% WCVI troll, 9.5% WA/OR Coast troll, and 7.4% WCVI sport. The long-term average catch, however, was distributed mostly among three fisheries with WCVI troll and WA/OR Coast troll playing a larger role: 18.2% WCVI troll, 12.1% WA/OR Coast troll, and 8.8% terminal net; WCVI sport had considerably less long-term impact (4.0%). Details on the smaller fisheries can be found in Appendix C16.

For the lower river bright LRW stock, escapement generally made up a greater proportion of total run than did fisheries impacts. Escapement percentages were similar during both the recent time period (55.4%, 1999–2011) and the long-term time period (56.8%, 1981–2011). There were two fisheries that took 5% or more of the total run in the recent average: 12.6% SEAK troll and 6.3% terminal sport (Columbia River). On the other hand, there were four such fisheries in the long-term average: 9.8% SEAK troll, 7.9% terminal sport, 6.7% terminal net, and 5.7% WCVI troll. During the 1985–1995 period, terminal net had considerably higher impact (12.0%). Details on the smaller fisheries can be found in Appendix C17.

For the Snake River LYF stock, escapement generally made up a smaller proportion of the total run than did fisheries impacts. Escapement levels were similar for both the recent time period (43.4%, 1999–2011) and the long-term time period (43.1%, 1989–2011). There were four fisheries with 5% or more of the distribution in the recent average: 21.1% terminal net, 8.0% WA/OR Coast troll, 5.5% WCVI troll, and 5.0% terminal sport. The long-term average distribution had somewhat higher impacts by WA/OR Coast troll, otherwise impacts were similar: 19.5% terminal net, 8.9% WA/OR Coast troll, 8.5% WCVI troll, and 4.2% terminal sport. During 1985–1995, WCVI troll had considerably greater impact (15.2%) and terminal sport had substantially less impact (2.4%). Details on the smaller fisheries can be found in Appendix C18.

For the Spring Creek Hatchery Tule SPR stock, escapement generally made up a much smaller proportion of total calendar year run than did fisheries impacts. The percentage of escapement was higher during the recent time period (37.1%, 1999–2011) than it was during the long-term time period (29.9%, 1979–2011). There were three fisheries with 5% or more of the total run in the recent average, with impacts dominating in terminal net: 33.1% terminal net, 10.0% WA/OR Coast troll, and 8.0% WCVI troll. Combined, these three fisheries had greater impacts in the long-term average, resulting in the lower escapement percentage: 29.5% terminal net, 13.9% WCVI troll, and 12.4% WA/OR Coast troll. During 1979–1984, five fisheries had more than 5% impact: 25.4% WCVI troll, 23.3% terminal net, 17.3% WA/OR Coast troll, 5.9% WA/OR Coast sport, and 5.4% Puget Sound sport. Details on the smaller fisheries can be found in Appendix C35.

For the upriver SUM stock, escapement generally made up a somewhat smaller proportion of total calendar year run than did fisheries impacts. Escapement distribution was marginally less during the recent time period (42.5%, 1999–2011) than it was during the long-term time period (47.3%, 1979–2011). There were five fisheries with 5% or more of the total run in the recent average: 14.5% SEAK troll, 9.4% terminal net, 7.9% WCVI troll, 7.6% terminal sport and 6.3% WA/OR Coast troll. There were four such fisheries in the long-term average: 13.1% SEAK troll,

9.5% WCVI troll, 7.2% terminal net and 5.8% WA/OR Coast troll. During 1979–1984, only three fisheries had 5% or more impact, and in all three cases the impacts were considerably higher than in the recent or long-term averages: 24.1% SEAK troll, 17.6% WCVI troll, and 8.6% NBC troll. Details on the smaller fisheries can be found in Appendix C41.

For the upriver right URB stock, escapement generally was less than fisheries impacts. Relative escapement was higher during the recent time period (46.2%, 1999–2011) than it was during the long-term time period (43.7%, 1979–2011). There were three fisheries with 5% or more of the total run in the recent average: 17.6% terminal net, 13.5% SEAK troll and 8.9% terminal sport. However, there were five fisheries in the long-term average with 5% or greater impact: 19.4% terminal net, 13.3% SEAK troll, 6.0% North Central British Columbia troll, 5.3% terminal sport, and 5.2% WCVI troll. During 1979–1984, SEAK troll (18.0%) had greater impact but terminal net (10.0%) and terminal sport (0.4%) had considerably lower impact. Details on the smaller fisheries can be found in Appendix C44.

For the Willamette Spring Hatchery WSH stock, escapement percentages were less than fisheries impacts. Percentages of escapements were higher during the recent time period (61.2%, 1999–2011) than they were during the long-term time period (55.0%, 1979–2011). There were two fisheries with 5% or more of the total run in the recent average: 22.6% terminal sport, and 6.7% terminal net. There were three such fisheries in the long-term average: 24.7% terminal sport, 6.6% SEAK troll, and 6.0% terminal net. During 1979–1984, NBC troll (7.5%) had much greater impact but terminal sport (17.6%) had lower impact. Details on the smaller fisheries can be found in Appendix C46.

2.2.9.4 *Regional Summary for Columbia River Stocks*

Columbia River stocks' BYERs over the full time series of CWT data showed a wide range (Table 2.10). They were particularly high for SPR (mean 72%, range 48–93%) and particularly low for WSH (mean 12%, range 3–29%); however, the latter do not include terminal fishing, also the case for CWF. At the midpoint of the mean BYERs (i.e., four stocks with lower mean BYER, four with higher mean BYER) was SUM (mean 52%, range 21–74%). For the last complete BY, BYER was again lowest for WSH (7%) but was higher for LYF (80%), LRH (73%), and LRW (69%), than for SPR (68%). The midpoint value of BYER for the last complete BY was again that for SUM (63%). Four stocks (CWF, HAN, SPR, and WSH) had BYERs lower in the last complete BY than the time series mean. The other five stocks (LRH, LRW, LYF, SUM, and URB) had last complete BYER higher than the time series mean.

Survival rates also varied widely over the time series (Table 2.10). Both the lowest and highest survivals were observed for LRH (range 0.02–9.5%). The narrowest survival range was observed for HAN (0.2–4.0%). The lowest and highest means were estimated for CWF (0.7%) and WSH (3.0%), the latter being the only stock that has primarily yearling releases. The stock with the midpoint mean survival was SUM (1.3%), and its survival range was fairly typical (0.07–4.8%). For most stocks, survival was relatively low for the last complete BY: seven stocks (HAN, LRW, LYF, SPR, SUM, URB, and WSH) had survival lower than the time series mean, one stock (CWF) had survival equal to the time series mean, and one stock (LRH) had survival greater than the time series mean.

We compared escapement percentages between the groups of years (1999–2008, 2009–

present) following the last two Agreements (Table 2.10). During 1999–2008, the lowest mean escapement percentage was observed for SPR (mean 38%, range 30–50%, the narrowest range), and the highest mean escapement percentage was observed for WSH (mean 64%, range 51–73%). At the midpoint were CWF (mean 52%, range 25–68%, the widest range) and LRH (mean 52%, range 38–71%). During 2009–present, the lowest mean escapement percentage was observed for LYF (mean 21%, range 13–37%), and the highest mean escapement percentage was observed for CWF (mean 73%, range 64–90%). For the three stocks that had escapement goals established before 1999 (LRW, SUM, URB), the goal was not met for only LRW in four years (1999, 2007–2009).

2.2.10 North Oregon Coast Stocks

There are two hatchery-origin CWT indicator stocks representing the production of Chinook on the Oregon coast, the Salmon River Hatchery (SRH) release group and the Elk River Hatchery (ELK) release group. Both groups are fall ocean type subyearling stocks which are recovered earliest at the total age of 2. The SRH release group is used to indicate those metrics ascribed to the Northern Oregon Coast aggregate, while the ELK release group indicates those metrics affiliated with the Mid-Oregon Coast aggregate. There have been relatively consistent releases of a CWT group of Chinook from the SRH since 1976, with the exception of no releases in 1981. There has been consistent, if sometimes small (prior to 1989) releases from the ELK since 1977. Release group size for the ELK was somewhat normalized to higher levels after 1990. Average release group size between 1977 and 1989 was approximately 37,000, and between 1990 and 2007 this increased to an average of approximately 184,000. The ELK CWT group has benefited from the support of the Coded Wire Tag Improvement Team (CWTIT) program for the past several years. Without the support of this, or a similar, program, it is unlikely that either the release group size or their terminal recoveries can be supported into the foreseeable future.

2.2.10.1 *Brood Year Exploitation Rates*

BYERs for both the SRH and ELK exploitation rate indicator stocks include only those mortalities attributable to ocean fisheries (Figure 2.52; Table 2.11). The BYER has averaged 37% (range 63–21%) for the SRH releases. Data representing both BY 1977 and 1978 from the ELK hatchery are anomalous and not likely indicative of reasonable portrayals of this stock. BYER for the ELK has averaged 28% (range 18–44%), excluding BY 1977 and 1978. There is no discernible trend through time regarding the percentage of IM occurring in ocean fisheries for either SRH or ELK River hatchery releases.

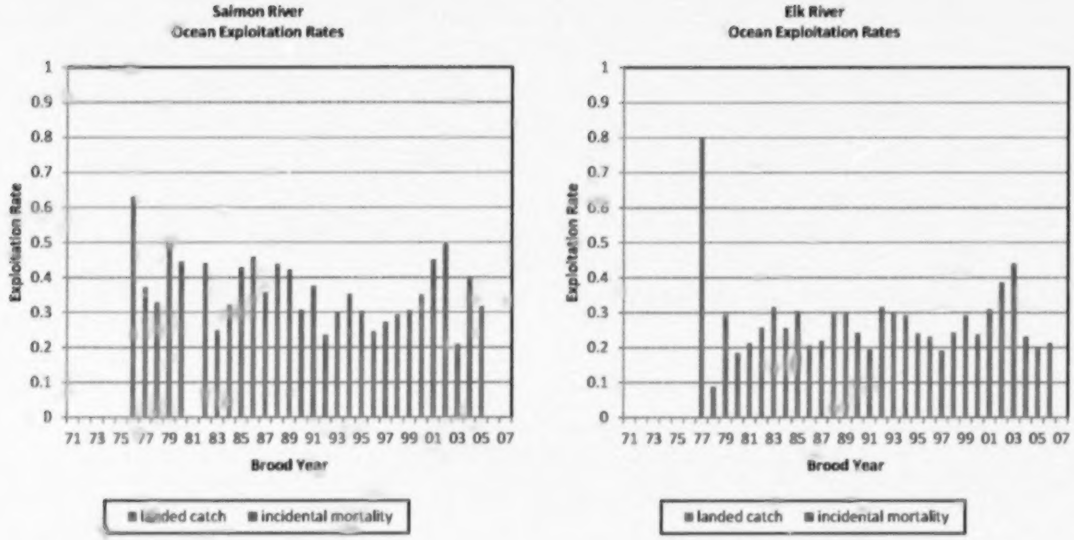


Figure 2.52 Brood year exploitation rate (ocean only) for Oregon Coast CWT indicator stocks. Catch and incidental mortality are shown. Only completed brood years are included.

Table 2.11 Summary of statistics generated by the 2012 CWT cohort analysis for Oregon Coast indicator stocks. Statistics include total mortality (catch plus incidental mortality) brood year exploitation rate (BYER), cohort survival rate to age 2, and calendar year (CY) percent distribution of the total mortality in the escapement for Agreement periods 1999–2008 and 2009–present.

						CY % Escapement[1]		
		BYER (total mortality)		Survival rate		1999–2008	2009–present	
Stock Abbrev.	Indicator Stock Name	Mean (range)	Last complete BY	Mean (range)	Last complete BY	Mean (range)	Mean (range)	Last CY (if ≠ current)
ELK	Elk River[2]	28% (9–80%)	21%	9.8% (1.1–33.9%)	17.8% (2006)	55% (32–72%)	56% (36–68%)	36%
SRH	Salmon River[2]	37% (21–63%)	32%	5.7% (1.1–10.7%)	3.3% (2005)	38% (18–56%)	35% (31–40%)	40%

[1] % Escapement is not a measure of performance for the escapement indicator stock(s) associated with a given CWT indicator stock. See CTC (2013) for these details.
[2] BYER is ocean exploitation rate only.

2.2.10.2 *Survival Rates*

Survival rates for both SRH and ELK Hatchery stocks are to age 2. Survival rates for ELK have been variable and averaged 9.8%, with a range of 1–34% (Figure 2.53; Table 2.11). Generally, ELK has had quite robust survival, averaging approximately 10%. This is among the highest average survival tracked coastwide by the CTC, exceeded only by the average survival displayed

by CHI (12%). Survival rates for SRH have been generally declining with a long-term average of 5.7%, with survival from the first three BYs averaging 7%, while the last three complete BY survivals averaged 3%. Still, comparatively SRH has relatively robust ocean survival compared to many of the other stocks tracked coastwide by the CTC. The EV index and the survival index are weakly correlated for the ELK with r = 0.33. The EV index and the survival index are moderately correlated for the SRH with r = 0.60.

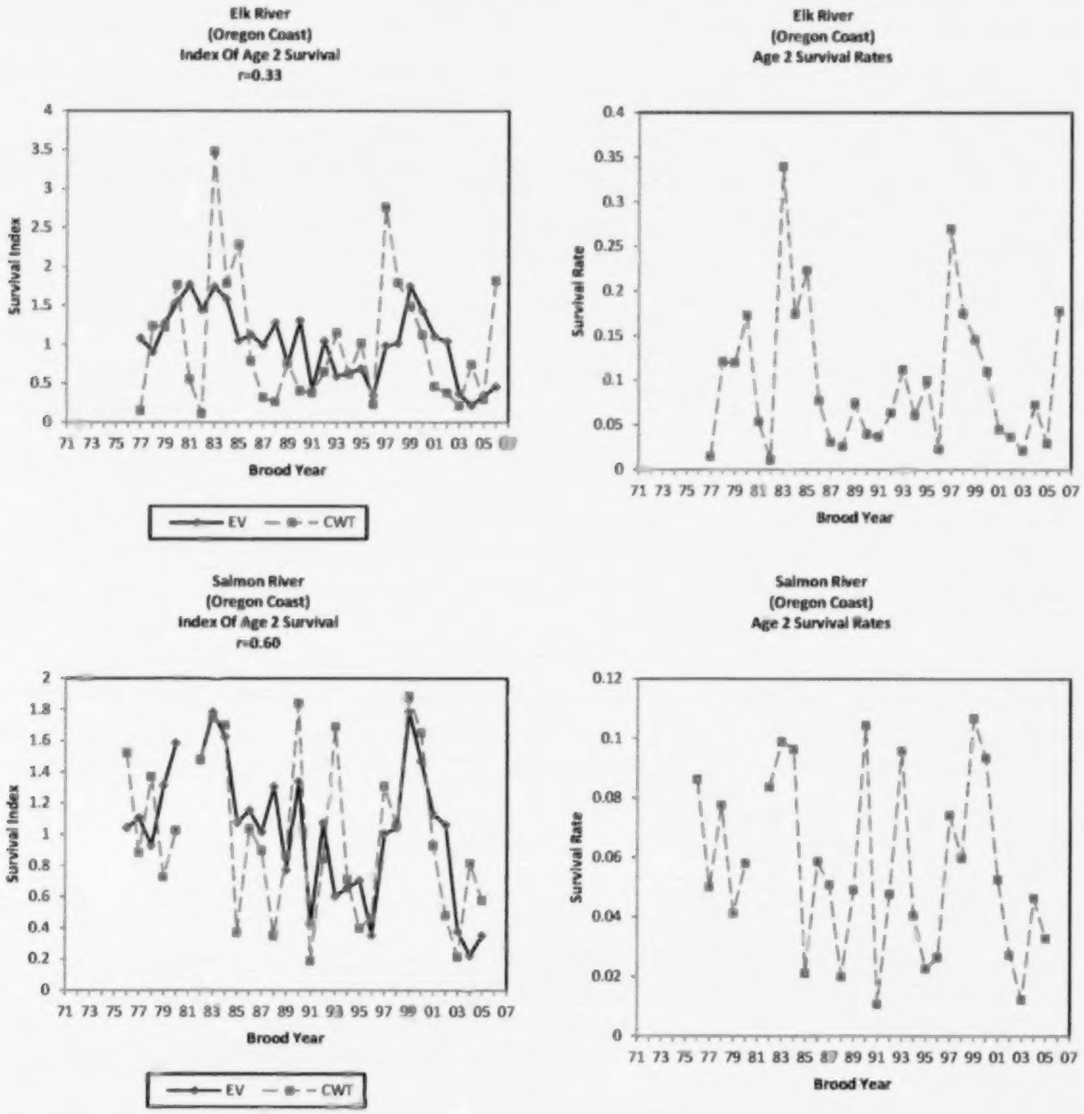


Figure 2.53 CWT survival and EV indices and survival rate for Oregon Coast indicator stocks. r: Pearson correlation coefficient between CWT and EV survival indices.

2.2.10.3 *Mortality Distributions*

An average of 37% of SRH (Appendix C38) mortality is attributed to escapement for the 1979–2011 time series (Table 2.11), and an average of 47% of the ELK (Appendix C9) mortality is attributed to escapement for the 1981–2011 time series (Table 2.11). *Mortality to escapement* is the proportion of recruitments which occurred during a BY's lifetime between fisheries and spawning escapement. Both stocks exhibit slight variation in the proportion of the recruitment which escapes to spawn through the time series, but there is no visible trend. Judging from 1999–2011 calendar year data, the largest impacts on the SRH stock occur in SEAK troll fisheries (18%), NBC troll (8%), NBC sport (4%) and terminal sport (28%). During the same time period, the largest impacts on the ELK stock occur in SEAK troll (7%), NBC troll (4%), ISBM troll WA/OR (17%), and terminal sport fisheries (14%). WCVI troll used to be a larger component of the impacts on the ELK stock (6%: 1979–1984), but has impacted this stock less in more recent years (2%: 1999–2011). These impact distributions are displayed graphically in Figure 2.54.

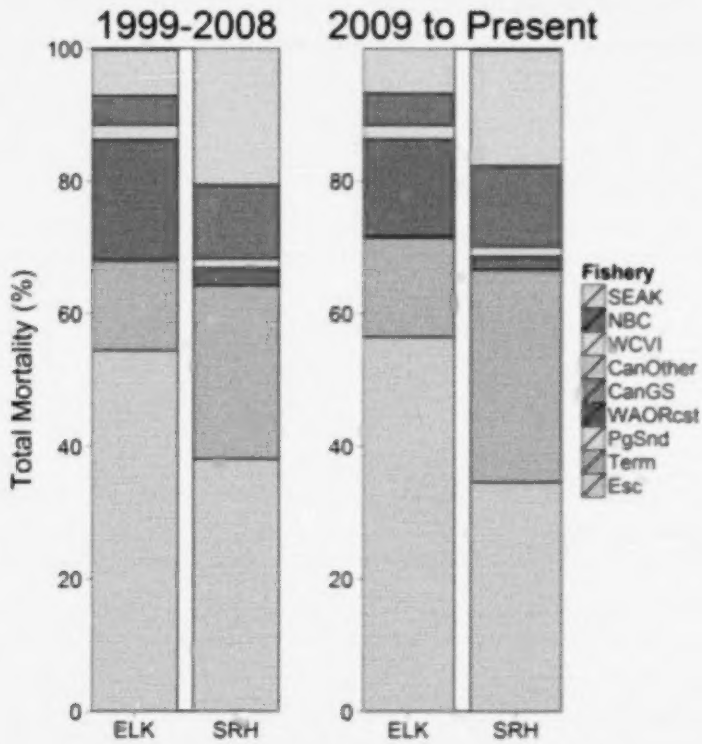


Figure 2.54 Distribution of total mortality for Oregon Coast indicator stocks for the current (2009–present) and previous (1999–2008) agreement periods.

3 Model Calibration and Output

Results from the annual calibration of the PSC Chinook model are used to calculate (1) preseason AIs for the three AABM fisheries, (2) postseason AIs for the previous year, and (3) preseason ISBM indices. The preseason AIs for 2013 are used to estimate the allowable 2013 catch of Treaty Chinook salmon for AABM fisheries. Postseason AIs are used to determine the previous (2012) season's allowable catches and to evaluate compliance in AABM fisheries. For the ISBM fisheries, the Agreement specifies that Parties will limit total AEQ mortality in ISBM fisheries to no greater than 63.5% for Canada and 60% for the U.S. relative to that observed in the base period 1979–1982 on the indicator stocks identified in Attachments IV and V for stocks not achieving their management objectives. The ISBM index is used to estimate annual exploitation rates relative to the base period for those fisheries. Forecasts of the 2013 ISBM indices are computed using the PSC Chinook model. Postseason ISBM indices for 2011 (all ISBM stocks) and 2012 (Canadian ISBM stocks) are computed using results of the ERA. The Agreement specifies that the postseason ISBM indices estimated through ERA of CWT recoveries will be used to assess compliance in ISBM fisheries; however, postseason indices are computed on a two-year lag because some CWT data are reported two years later. Additionally, postseason CWT-based ISBM indices provide insight on the performance of the (preseason) model-generated index.

3.1 Model Calibration

This section describes the calibration data and procedures used. For reference, a list of indicator stocks and fisheries in the model is provided in Appendix A. Estimation of the model base period parameters is described in the draft model documentation (CTC AWG 1991). For 2013, the model used was the same as used during the PST negotiations (CLB 9812), with the actual catches, escapements, and other data through 2012 added. In addition, CTC-agreed escapement goals were used where available and the form of the Ricker production function was adjusted for those stocks with newly agreed goals (e.g., Harrison River fall Chinook salmon).

3.1.1 Calibration Data

The first step in the annual calibration process is to gather new or revised data to update the model input files. For example, the file containing run size data is updated as preseason forecasts and postseason estimates become available, since model predictions are sensitive to preseason forecasts and postseason estimates of terminal runs. Months in which forecasts are available for each stock, and the month the final return estimate becomes available, are presented in Table 3.1.

The model is recalibrated annually to incorporate observed data from the previous year and available abundance forecasts for the current year. In addition, recalibration may also occur when significant changes in one or more of the following model input files are made.

1. BSE (base): This file contains basic information describing the structure of the model, i.e., the number and names of stocks and fisheries, age classes, the base period, identification of terminal fisheries, and stock production parameters. This file may be modified annually to incorporate productivity parameters that correspond to new CTC-

agreed escapement goals.

2. CEI (ceiling): This file contains historical catch data for the 19 fisheries that are modeled as ceiling or catch quota fisheries (as opposed to fisheries modeled solely through control of exploitation rates) through the most recent fishing season.
3. CNR (Chinook salmon nonretention): Data used by the model to estimate mortalities during CNR periods are read from the CNR file. The data in the CNR file depends on which method is used to calculate CNR mortality. It may include direct estimates of encounters during the CNR period or indicators of fishing effort in the CNR period relative to the retention period.
4. ENH (enhancement file): For 13 hatchery stocks and one natural stock (Lower Strait of Georgia Naturals) with supplementation, this file contains productivity parameters as well as the differences (positive or negative) in annual smolt production relative to the Base Period. Additional discussion of the productivity parameters may be found in the draft model documentation (CTC AWG 1991).
5. FCS (forecast): Agency supplied annual estimates of terminal run sizes or escapements as well as preseason forecasts are contained in the FCS file. Age-specific information is used for those stocks and years with age data (Table 3.2). For those stocks with externally provided forecasts of abundance in 2013, management agencies used two general methods to predict terminal returns or escapements.
    a. Sibling Models: Empirical relationships between abundance (commonly measured as terminal run size) of age *a* fish in calendar year CY and the comparable abundance of age *a*+1 fish in year CY+1 are used to predict abundance in 2012 from data collected in previous years (forecast type S in Table 3.2).
    b. Average Return Rate Models: Return rates of adults by age from smolts or parents are averaged over past BYs, then these averages are used to discount abundance of smolts or parents for BYs that will be exploited in 2013 (forecast type R in Table 3.2).
6. FP (fishery policy): This file contains scalars specific to year, fishery, stock, and age that are applied to base period fishery exploitation rates. The FPs are used to scale annual fishery exploitation rates relative to the model base period and can be used for a variety of purposes. For example, for the ocean areas of the Washington and Oregon North of Cape Falcon (WA/OR) troll fishery, the FPs are used to model differential impacts on Columbia River and Puget Sound stocks as the proportion of the catch occurring in the Strait of Juan de Fuca varies. The source of the FPs is generally the reported catch fishery index computed from CWT data in the annual ERA or the ratios of harvest rates computed from terminal area run reconstructions.
7. IDL (interdam loss): The IDL file contains stock-specific conversion factors for the Columbia River Summer, Columbia Upriver Bright, Spring Creek Tule, and Snake River Fall stocks provided each year by Columbia River fishery managers. The factors represent the fraction of the stock that can be accounted for after mainstem dam

passage in the Columbia River; losses can be attributed to direct mortality at the various dams, mortality in the reservoirs between dams, fall-backs, tailrace spawning, and other factors. The interdam loss factor is equal to one minus the conversion factor.

8. IM (changes in incidental mortality rates): The IM file contains the incidental mortality rates by fishery for legal and sublegal fish that differ from those used in the base period due to alterations in gear, regulations, or fishery conduct.
9. MAT (maturity and AEQ factors): The MAT file has annual estimates of maturation rates and AEQ factors for 12 stocks (AKS, BON, CWF, FRL, GSH, LRW, ORC, RBH, RBT, SPR, URB, and WSH). These estimates replace the base period rates in the BSE file. The annual estimates are obtained from the annual ERA. Average values are used for years beyond the last year for which estimates are available (due to incomplete broods and the one year lag for completion of the annual ERA).
10. PNV (proportion nonvulnerable): A PNV file is created for each fishery for which a size limit change has occurred since the model base period. Each file contains age-specific estimates of the proportion of fish not vulnerable to the fishing gear or smaller in length than the minimum size limit. The PNVs were estimated from empirical size distribution data; in some instances independent surveys of encounter rates were used to adjust the PNV for age-2 fish to account for the proportion of the cohort that was not vulnerable to the fishing gear.
11. STK (stock): This file contains the stock- and age-specific starting (base period) cohort sizes, the base period exploitation rates on the vulnerable cohort for each model fishery, maturation schedules, and AEQ factors. This file is updated if new stocks or fisheries are added, new CWT codes are used to represent distribution patterns of existing model stocks, or a re-estimation of base period data occurs. Modification of this file will result in a model different from that used in the negotiations (CLB 9812).

The calibration is controlled through a file designated with an OP7 conversion extension.

Table 3.1 ***Months when agencies are able to provide final return estimates for the previous year and preseason forecasts of abundance for the next fishing year.***

Model Stock	Month Final Return Estimate Available	Month(s) Forecast Available
Alaska South SE	January	None
North/Central B.C.	November	None
WCVI Natural	January	February
WCVI Hatchery	January	February
Upper Strait of Georgia	January	None
Lower Strait of Georgia Hatchery	December	None
Lower Strait of Georgia Natural	December	None
Fraser Early	January	None
Fraser Late	February	February
Nooksack Spring	June	February
Nooksack Fall (Samish)	June	February
Snohomish Wild	June	February
Skagit Wild	June	February
Puget Sound Natural Fingerling	June	February
Stillaguamish Wild	June	February
Puget Sound Hatchery Fingerling	June	February
Puget Sound Hatchery Yearling	June	February
Washington Coastal Wild	June	March[1]
Washington Coastal Hatchery	June	March[1]
Cowlitz Spring Hatchery	June	December
Willamette River Hatchery	June	December
Columbia River Summer	September	February
Fall Cowlitz Hatchery	April	February, April[2]
Spring Creek Hatchery	April	February, April
Lower Bonneville Hatchery	April	February, April
Upriver Brights	April	February, April
Snake River Wild Fall	April	April
Mid-Columbia River Bright	April	February, April
Lewis River Wild	April	February, April
Oregon Coast	February	February

[1] Normally forecasts are not available for the model calibration, but these were available in 2012.

[2] A preliminary ocean escapement forecast is released in February. An updated ocean escapement forecast reflecting the ocean fishery option adopted by the Pacific Fisheries Management Council is released in April.

Table 3.2 Methods used to forecast the abundance of stocks in the PSC Chinook Model.

Model Stock	Forecast Characteristics			Comments
	Forecast Type[1]	Preseason Age-specific	Postseason Age-specific	
Alaska South SE	C	-	Yes	Calibrated to escapement
North/Central B.C.	C	-	No	Calibrated to terminal run
WCVI Hatchery + Natural (RBH and RBT model stocks)	S	Yes	Yes	Robertson Creek Hatchery forecasts plus expansion for other WCVI stocks based on ratio of terminal run sizes
Upper Strait of Georgia	C	-	Partial	Calibrated to escapement
Lower Strait of Georgia Hatchery	C	-	Yes	Calibrated to escapement to GSH hatchery systems and Squamish River
Lower Strait of Georgia Natural	C	-	Yes	Calibrated to escapement to Cowichan and Nanaimo Rivers
Fraser Early	C	-	No	Calibrated to terminal run
Fraser Late	S	Yes	Yes	Combined forecasts of escapements for Harrison River and Chilliwack Hatchery
Nooksack Spring	R	No	No	Calibrated to escapement
Nooksack Fall (Samish)	R	No	No	Recent year average return rate
Snohomish Wild	R	No	No	Recruits per Spawner
Skagit Wild	R	Yes	Yes	Average cohort return rate
Puget Sound Natural Fingerling	R	No	No	Calibrated to terminal run
Stillaguamish Wild	R	No	No	Recruits per Spawner
Puget Sound Hatchery Fingerling + Yearling	R	No	No	Age-specific forecasts not available for all components
Washington Coastal Wild	R	No	No	Average return rate
Washington Coastal Hatchery	R	No	No	Average return rate
Cowlitz Spring Hatchery	S	Yes	Yes	Prediction is to mouth of tributary streams
Willamette River Hatchery	S	Yes	Yes	Prediction is to mouth of Willamette River
Columbia River Summer	S	No	No	Run reconstruction used to estimate Columbia River mouth return
Spring Creek Hatchery	S	Yes	Yes	Run reconstruction used to estimate Columbia River mouth return
Lower Bonneville Hatchery	S	Yes	Yes	Run reconstruction used to estimate Columbia River mouth return
Upriver Brights	S	Yes	Yes	Run reconstruction used to estimate Columbia River mouth return
Lyons Ferry (Snake River Wild Fall)	R	No	No	Calibrated to escapement to Lower Granite.
Mid-Columbia River Bright	S	Yes	Yes	Run reconstruction used to estimate Columbia River mouth return
Lewis River Wild	S	Yes	Yes	Run reconstruction used to estimate Columbia River mouth return
Oregon Coast	S	Yes	Yes	Weighted average age composition from four index rivers

[1]Externally provided forecast type codes are S = sibling; R = return rate; C = model internally estimated projection.

3.1.2 Calibration Procedures

An objective of the calibration procedure is to estimate stock and BY specific EV scalars. The calibration uses an iterative algorithm to estimate the EV scalars for each BY and model stock to account for annual variability in natural mortality in the initial year of ocean residence. EV scalars are used to adjust age-1 abundances estimated for each stock and BY from escapements in combination with the base period spawner-recruit functions. Fishing impacts and natural mortalities are then applied through model processes. EVs also adjust for biases resulting from errors in the data or assumptions used to estimate the base period parameters for the spawner-recruit functions.

EVs are estimated through the following steps for stocks calibrated to age-specific terminal run sizes:

1. Predicted terminal runs are first computed for each year using the input files discussed above and the base period stock-recruitment function parameters (i.e., EV stock productivity scalars set equal to 1).
2. The ratio (SC_{BY}) of the observed terminal run and the model predicted terminal run from the previous step is computed for each BY. For example, if the estimated and model predicted terminal runs for the 1979 brood were 900 and 1,500 age-3 fish in 1982, 4,000 and 4,500 age-4 fish in 1983, and 1,000 and 1,500 age-5 fish in 1983, the ratio would be computed as

$$SC_{BY} = \frac{\sum_{a=Minage}^{Maxage}(ObservedTerminalRun)_a}{\sum_{a=Minage}^{Maxage}(ModelPredictedTerminalRun)_a}$$

Equation 3.1

$$SC_{BY} = \frac{900+4000+1000}{1500+4500+1500}$$

Equation 3.2

   In the absence of age-specific estimates of the terminal run, the components are computed by multiplying the total terminal run by the model predictions of age composition.

3. The EV for iteration *n* and brood year *BY* is computed as:

$$EV_{n,BY} = EV_{n-1,BY} * SC_{BY}$$

Equation 3.3

4. Steps 1–3 are repeated iteratively until the absolute change in the EVs for all stocks is less than a predetermined tolerance level (0.05). The tolerance level can be changed if more precise agreement is desired:

$$\left| \frac{EV_{n,BY} - EV_{n-1,BY}}{EV_{n-1}} \right| < 0.05 \qquad \textit{Equation 3.4}$$

Several options for the calibration are provided in the OP7 control file. The options include the ability to control the BYs for which the EVs are estimated in each iteration and also the type of convergence criteria. For the 2013 preseason calibration, in each iteration EVs were estimated for all BYs. Convergence was defined at an EV change tolerance level of 0.05.

Stock-specific calibration options are specified in the FCS file and discussed below.

- Minimum Number of Age Classes: Data for all age classes will not be available when the EVs are estimated for recent, incomplete broods. Since considerable uncertainty may exist in a single data point, application of the calibration algorithm can be restricted to cases in which a specific minimum number of age classes are present.
- Minimum Age: Considerable uncertainty often exists in the estimates of terminal runs or escapements for younger age classes, particularly age 2. The minimum age class to include in the calibration algorithm is specified in the FCS file.
- Estimation of Age Composition: Age-specific estimates of the terminal run or escapement may not be available. An option is provided to estimate the age composition using base period maturation and exploitation rates.

The 2013 calibration was completed in two stages to facilitate computation of the average exploitation rates and incorporation of the agency forecasts. The Stage 1 calibration provided initial estimates of exploitation rate scalars for fishing years 1979–2011 using updated catch and escapement data through 2011. Average exploitation rate scalars ($\overline{FP}$) were then computed and used as input values for the 2012 and 2013 fisheries in the Stage 2 calibration, except that the forecasts for the WCVI and Fraser Late (FRL) stocks already accounted for changes in the ocean fisheries.

The $\overline{FP}$ for each model fishery was obtained from the Stage 1 calibration using the following formula (subscripts follow those defined in Table 2.3):

$$\overline{FP}_{a,s,CY,f} = \frac{\sum_{CY=CY_{start}}^{CY_{end}} RT_{CY} * FP_{s,a,CY,f}}{(CY_{end} - CY_{start})} \qquad \textit{Equation 3.5}$$

The range of years used to compute the $\overline{FP}$ varied between stocks and was fishery- and age-specific. The input files used in the Stage 2 calibration were identical to those used in Stage 1 with two exceptions: the average exploitation rate scale factors for each fishery were inserted into the $\overline{FP}$ file for 2012, and the Stage 1 EVs were used as starting values for the Stage 2 calibration.

To determine the acceptability of a calibration by the CTC (i.e., whether an annual calibration is deemed final by the CTC), several results are examined.

1. Accuracy of the reconstructed catches in the fisheries (these values will consistently differ from the actual catches if the calibration is not able to exactly recreate the actual catches in the years 1979 through 1984, the model years used prior to implementation of the ceiling algorithm)
2. Accuracy of model predicted terminal runs or escapements relative to the data used for calibration of each stock
3. Comparison of model predicted age structure in terminal runs or escapements with the data used for calibration (consistent biases in age structure are addressed by changing maturation rates)
4. Patterns in the EVs compared with marine survival patterns generated by the annual ERA
5. Comparison of CWT-based and model estimates of fishery harvest rate indices,
6. Comparison of model estimates of mortality distributions for individual stocks to those generated from the annual CWT-based ERA
7. Comparison of model estimated AIs to the AIs previously estimated by model CLB 9812

Calibration usually involves an iterative process until a judgment is made by the CTC that an acceptable fit to all the data was achieved. This decision usually involves an inspection and trial-and-error process. The determination of whether or not further calibrations are necessary is based principally on the significance of deviations from observed or estimated values for stocks and fisheries most relevant to the issues to be evaluated and on the time constraints established for completion of the calibration.

3.1.3 Key Calibration Outputs

The PSC Chinook Model was originally constructed as a tool to evaluate the effect of fishery management actions on the rebuilding of depressed Chinook stocks. However, since the implementation of the 1999 PST Agreement, the primary purpose of the Chinook model has been to enable abundance-based management in the PST through the production of fishery abundance indices. The PSC Chinook Model generates preseason projections of abundance indices (AIs) for the SEAK, NBC, and WCVI AABM fisheries and postseason estimates of the AIs that enable evaluations of AABM performance (i.e., pre- versus postseason AI and allowable catch comparisons). For each AABM fishery (*f*), an abundance index (AI) is computed for the upcoming fishing year (*CY*) as

$$AI_{f,CY} = \frac{\sum_s \sum_a Cohort_{s,a,CY} ER_{s,a,f}(1-PNV_{a,f})}{\sum_s \sum_a Cohort_{s,a,BP} ER_{s,a,f}(1-PNV_{a,f})} \qquad \textit{Equation 3.6}$$

where $Cohort_{s,a,CY}$ and $Cohort_{s,a,BP}$ are preseason (projected) and base period (*BP*, fishing years 1979–1982) abundances of model stocks (*s*), by age (*a*), respectively. Thus, the AI is simply a

ratio of the estimated total catch at present and base period abundance levels given a base period fishing pattern. Given the preseason AI projections, the estimated allowable catches are then set for the three AABM fisheries according to the terms specified in Appendix B of Chapter 3, Annex IV of the 2009 Chinook Agreement.

In addition to generating AIs, the Chinook model provides other information of immediate relevance to PSC management, as well as for use in efforts aimed at assessing its accuracy. First, the Chinook model provides fishery-specific projections of AEQ total mortality for model stocks, thereby allowing for estimation of potential ISBM fishery harvests on a preseason basis. Additionally, these mortality estimates provide a means for computing a Chinook model analog to CWT exploitation rates which can be compared for model validation/verification purposes. Second, the model provides estimates on the stock composition of AABM and ISBM fishery catches, thereby providing a means to quantitatively estimate the relative contribution different stocks make to particular fisheries during the current as well as past fishing year.

3.1.4 Changes from Previous Calibration Procedures

Since 2007 there has been a consistent positive bias in the preseason AI forecasts in all three AABM fisheries. Previous investigations by the AWG into discrepancies in the model estimates of the stock and age-specific cohort sizes between the pre- and postseason calibrations suggested there were overestimation problems with several driver stocks in the model. In addition, previous investigations of the stock- and age-specific maturation rates of stocks in the ERA indicated that there were definite trends in several stocks of increasing maturation rates of the younger ages in recent years. These investigations suggested that the assumptions used in the model calibration process—consisting of recent five-year average EVs (spawner-recruit production scalars) and long-term average maturation rates for forecasting the recent incomplete broods—were likely contributing to the overestimation problem in the AABM AIs. In order to determine if a different combination of EV and maturation rate averages could reduce the bias in the preseason AI estimates, a series of retrospective analyses were performed by recalibrating the 2004–2012 Chinook model calibrations for a number of EV and maturation rate combinations. Combinations consisting of three-year, five-year and long-term average maturation rates and one-year through five-year average EVs were run. However, since the analysis for each combination required 27 runs of the Chinook model (9 years × 3 runs per year) not every possible combination of EVs and maturation rates was run. Several combinations that were unlikely to reduce the bias in the preseason AIs were omitted. The average mean squared errors (MSE) of the preseason versus first postseason AIs for each of the three AABM fisheries were compared, as well as the preseason and postseason AIs versus the *finals* (average of the third through eighth postseason AIs) MSEs. The combinations that produced the lowest and second to lowest MSEs were identified for each AABM fishery (Table 3.3). The minimum average MSE occurred with the one-year EV and five-year average maturation rate combination for eight of the nine AABM fishery versus pre/post comparisons (3 AABM fisheries × 3 comparison types).

The results of this investigation resulted in a change in the EV and maturation rate assumptions used for the 2013 preseason calibration. The 2013 preseason calibration used one-year EV and five-year average maturation rates for all of the model stocks. However, since the 2012

preseason Chinook model calibration was done with five-year average EVs and long-term average maturation rates, the 2012 postseason calibration was done using the same five-year average EVs and long-term average maturation rates for consistency. This resulted in two separate 2013 Chinook model calibrations. CLB 1308 was the preseason calibration for 2013 which used the one-year EVs and five-year average maturation rates, and CLB 1309 was the postseason calibration for 2012 that used the five-year average EVs and long-term average maturation rates. Given this departure from previous preseason calibrations, the AWG will continue to monitor the influence of EV and maturation assumptions on AI projections.

Table 3.3 MSE for differences between pre- and postseason AIs as a function of maturation rate and environmental variant (EV) averaging periods for SEAK, NBC, and WCVI AABM fisheries, 2004–2012.

SEAK

Preseason to Post-Season Years 3-8 Average

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0658		0.0681		0.0648
5	0.0500	0.0507	0.0521		0.0497
LTA[1]	0.0795	0.0793	0.0786	0.0763	0.0754

First Post-Season to Post-Season Years 3-8 Average

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0214		0.0215		0.0215
5	0.0118	0.0119	0.0119		0.0119
LTA[1]	0.0226	0.0229	0.0230	0.0230	0.0231

Preseason to First Post-Season

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0147		0.0158		0.0149
5	0.0129	0.0131	0.0136		0.0129
LTA[1]	0.0206	0.0203	0.0202	0.0193	0.0200

NBC

Preseason to Post-Season Years 3-8 Average

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0447		0.0464		0.0479
5	0.0308	0.0325	0.0326		0.0339
LTA[1]	0.0568	0.0608	0.0597	0.0598	0.0603

First Post-Season to Post-Season Years 3-8 Average

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0186		0.0188		0.0188
5	0.0115	0.0117	0.0118		0.0119
LTA[1]	0.0236	0.0245	0.0245	0.0245	0.0247

Preseason to First Post-Season

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0103		0.0109		0.0114
5	0.0070	0.0084	0.0082		0.0086
LTA[1]	0.0116	0.0125	0.0120	0.0124	0.0129

WCVI

Preseason to Post-Season Years 3-8 Average

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0236		0.0241		0.0249
5	0.0172	0.0174	0.0176		0.0184
LTA[1]	0.0179	0.0181	0.0183	0.0187	0.0191

First Post-Season to Post-Season Years 3-8 Average

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0031		0.0031		0.0031
5	0.0027	0.0026	0.0026		0.0026
LTA[1]	0.0027	0.0023	0.0023	0.0023	0.0023

Preseason to First Post-Season

Mat. Rate	EV Average Years				
Average Years	1	2	3	4	5
3	0.0105		0.0107		0.0110
5	0.0100	0.0102	0.0101		0.0103
LTA[1]	0.0132	0.0135	0.0134	0.0135	0.0138

Lowest MSE

Second Lowest MSE

[1] LTA = Long term average.

3.2 Model Calibration Results

3.2.1 Overview of 2013 Calibration Process

The CTC AWG met in Seattle during the week of March 19, 2013, to produce the Chinook model calibration for use in the upcoming fishing year. Several different model calibrations were completed, each differing in key input files. Calibrations 1301–1309 were run and discussed during the face-to-face meeting, and differed primarily in how their EVs and maturation rates were calculated and/or included various forecast and/or CNR file updates (Appendix K). The AWG converged on calibration 1309 for the 2012 postseason fishery assessment and calibration 1308 as the best representation of the model's estimation of preseason fisheries conduct. After the close of the meeting, further questions arose regarding the WCVI forecast—the accuracy and the effect on the model's performance. Two additional calibrations that addressed this issue, calibrations 1310 and 1311, were produced and discussed remotely during the following week. Calibrations 1310 and 1311 included a bias correction to the WCVI forecast. Following full bilateral CTC discussions, calibrations 1309 and 1308 were ultimately chosen as the final postseason (2012) and preseason (2013) calibrations. On April 4, the CTC produced its annual memo describing the year's calculated pre- and postseason AIs based on these model calibrations and circulated it amongst the PSC and associated management agencies.

3.2.2 AABM Fishery Calibration Results

3.2.2.1 *AABM Abundance Indices and Associated Catches*

The PST specifies that the AABM fisheries are to be managed through the use of the preseason AIs, where a specific estimate of the allowable harvest level corresponds to a given AI for each fishery. The preseason AIs that were used to establish harvest management targets are listed in Table 3.4. The 2013 preseason AI for the SEAK troll fishery is 1.20, for the NBC troll fishery it is 1.10, and for the WCVI troll fishery is 0.77. 2013 was the fifth year of the 2009 Agreement that reduced catches and associated harvest rates in Southeast Alaska (15%) and West Coast of Vancouver Island (30%) AABM fisheries from the allowable AABM catch levels in the 1999 PST Agreement in response to coastwide conservation concerns. The NBC AABM fishery retained the same allowable catch and harvest rates of the 1999 PST Agreement. If the CTC determines that inseason methods provide an improved estimate of the abundance relative to preseason indicators alone, inseason adjustments of preseason catch limits are permitted.

The postseason AI is a more accurate estimate of the abundance index for the AABM fisheries, and is used to compute the final allowable catch for each fishery. The final allowable catch is used to evaluate overage or underage of the landed catch relative to the harvest rate objective. Postseason AIs for 1999–2012 are listed in Table 3.4.

Table 3.4 Abundance Indices for 1999–2013 for the SEAK, NBC, and WCVI AABM fisheries. Postseason values for each year are from the first postseason calibration following the fishing year.

	SEAK		NBC		WCVI	
Year	**Preseason**	**Postseason**	**Preseason**	**Postseason**	**Preseason**	**Postseason**
1999	1.15	1.12	1.12	0.97	0.60	0.50
2000	1.14	1.10	1.00	0.95	0.54	0.47
2001	1.14	1.29	1.02	1.22	0.66	0.68
2002	1.74	1.82	1.45	1.63	0.95	0.92
2003	1.79	2.17	1.48	1.90	0.85	1.10
2004	1.88	2.06	1.67	1.83	0.90	0.98
2005	2.05	1.90	1.69	1.65	0.88	0.84
2006	1.69	1.73	1.53	1.50	0.75	0.68
2007	1.60	1.34	1.35	1.10	0.67	0.57
2008	1.07	1.01	0.96	0.93	0.76	0.64
2009	1.33	1.20	1.10	1.07	0.72	0.61
2010	1.35	1.31	1.17	1.23	0.96	0.95
2011	1.69	1.62	1.38	1.41	1.15	0.90
2012	1.52	1.24[1]	1.32	1.15[1]	0.89	0.76[1]
2013	1.20[1]		1.10[1]		0.77[1]	

[1] Due to changes in calibration procedures (reviewed in section 3.1.4), 2012 postseason (CLB 1309) and 2013 preseason (CLB 1308) AIs are based on different calibrations; the procedures and assumptions CLB 1309 mirror those used during the 2012 preseason calibration.

The 2009 PST Agreement specifies the allowable catch for various values of the AI for each fishery. Allowable catches for 1999–2008 were from Table 1 in the Chinook Annex to the 1999 PST Agreement. In the 2009 PST Agreement, the relationship between the AI and the allowable catch changed for SEAK and WCVI; thus the allowable catches since 2009 were derived from Table 1 of the Chinook Annex to the 2009 Agreement. The allowable treaty catch by fishery and year based on pre- and postseason AIs and the observed treaty catches are given in Table 3.5 and are shown in Figures 3.1– 3.6; in Figure 3.1–3.3, the solid line represents the relationship between AIs and allowable catch under Table 1 of the annex.

Table 3.5 Preseason allowable catches for 1999–2013, and postseason allowable catches and observed catches for 1999–2012, for AABM fisheries. Postseason values for each year are from the first postseason calibration following the fishing year.

PST Treaty Allowable and Observed Catches									
	SEAK (T, N, S)[1]			NBC (T, S)[1]			WCVI (T, S)[1]		
Year	Preseason Allowable Catch	Postseason Allowable Catch	Observed Catch	Preseason Allowable Catch	Postseason Allowable Catch	Observed Catch	Preseason Allowable Catch	Postseason Allowable Catch	Observed Catch
1999	192,800	184,200	198,842	145,600	126,100	86,726	128,300	107,000	36,413
2000	189,900	178,500	186,493	130,000	122,500	31,900	115,500	86,200	101,438
2001	189,900	250,300	186,919	132,600	158,900	43,500	141,200	145,500	117,670
2002	356,500	371,900	357,133	192,700	237,800	150,137	203,200	196,800	165,036
2003	366,100	439,600	379,519	197,100	277,200	191,657	181,800	268,900	175,821
2004	383,500	418,300	417,019[2] 421,666	243,600	267,000	241,508	192,500	209,600	216,624
2005	416,400	387,400	390,336[3]	246,600	240,700	243,606	188,200	179,700	202,662
2006	346,800	354,500	361,283[3]	223,200	200,000	215,985	160,400	145,500	146,883
2007	329,400	259,200	327,989[3]	178,000	143,000	144,235	143,300	121,900	139,150
2008	170,000	152,900	171,983[3]	124,800	120,900	95,647	162,600	136,900	145,726
2009[4]	218,800	176,000	227,667[3]	143,000	139,100	109,470	107,800	91,300	124,617
2010	221,800	215,800	229,355[3]	152,100	160,400	136,613	143,700	142,300	139,047
2011	294,800	283,300	292,028[3]	182,400	186,800	122,660	196,800	134,800	204,232
2012	266,800	205,100	241,015[3]	173,600	149,500	120,307	133,300	113,800	134,468
2013	176,000			143,000			115,300		

[1] T = troll, N = net, and S = sport.

[2] The lower value resulted from subtracting a disputed terminal exclusion catch for the Stikine River in 2004. Catch accounting has since been defined in the Transboundary Agreement.

[3] Values changed because the method used to partition gillnet catch into large and nonlarge fish has changed. This change affects the computation of the terminal exclusion, add-on, and treaty catch.

[4] This is the first catch year in which fisheries operated under the provisions of the 2009 Agreement.

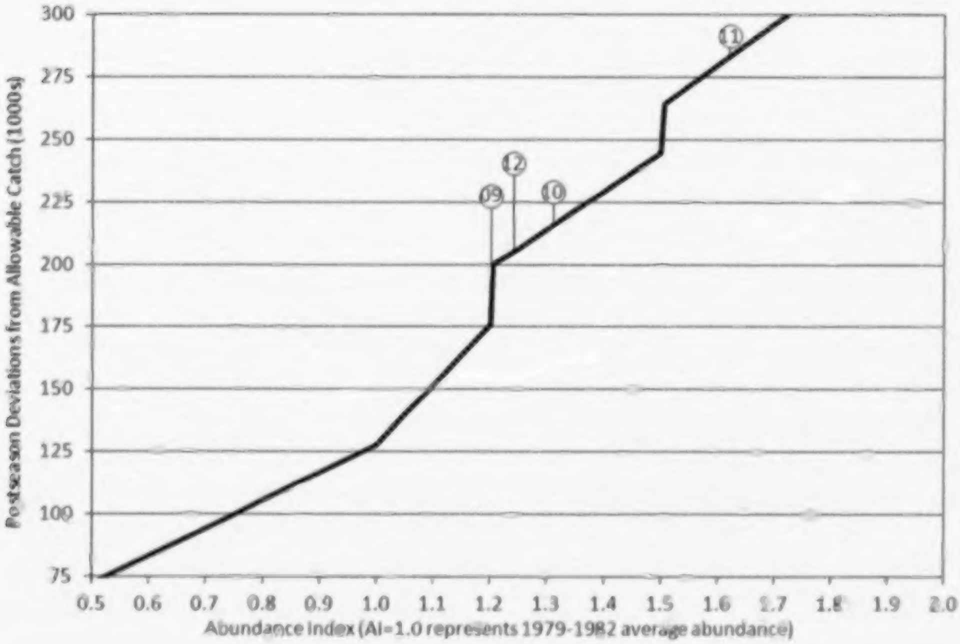


Figure 3.1 Postseason deviations from allowable catch levels in the SEAK AABM fishery.

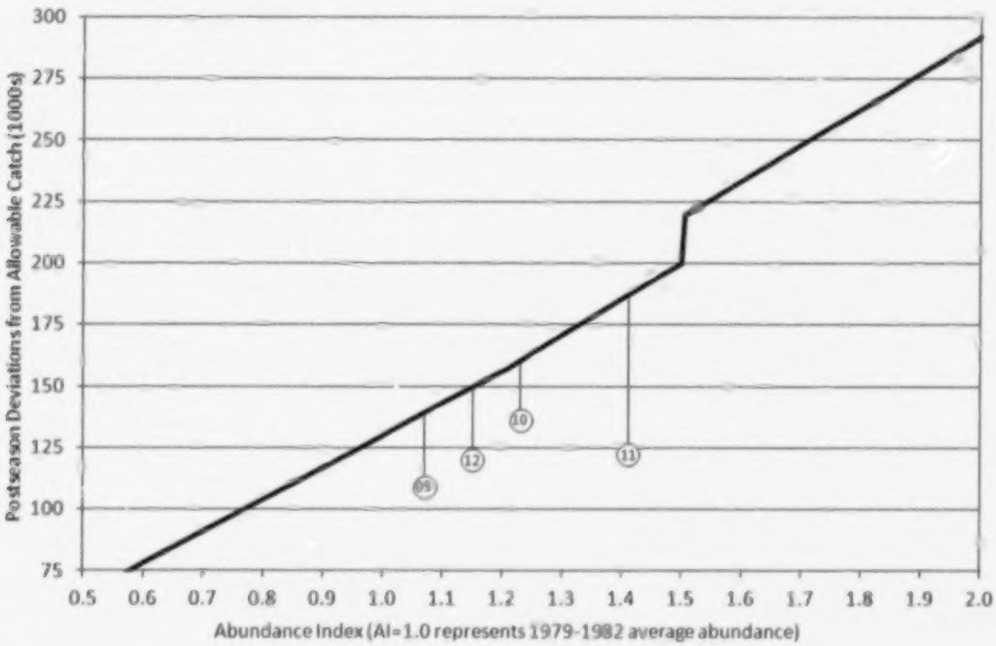


Figure 3.2 Postseason deviations from allowable catch levels in the NBC AABM fishery.

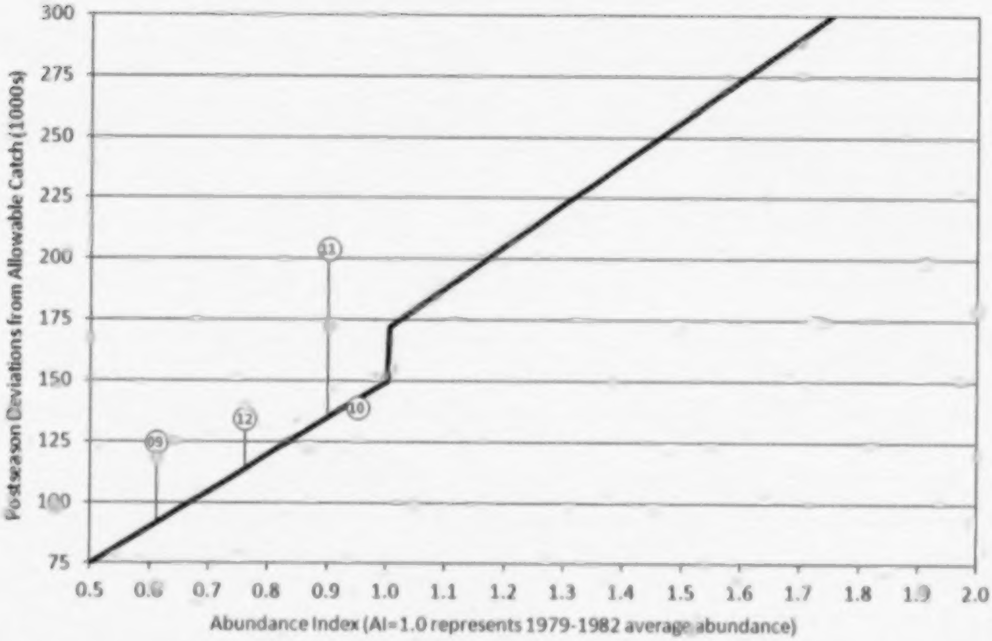


Figure 3.3 Postseason deviations from allowable catch levels in the WCVI AABM fishery.

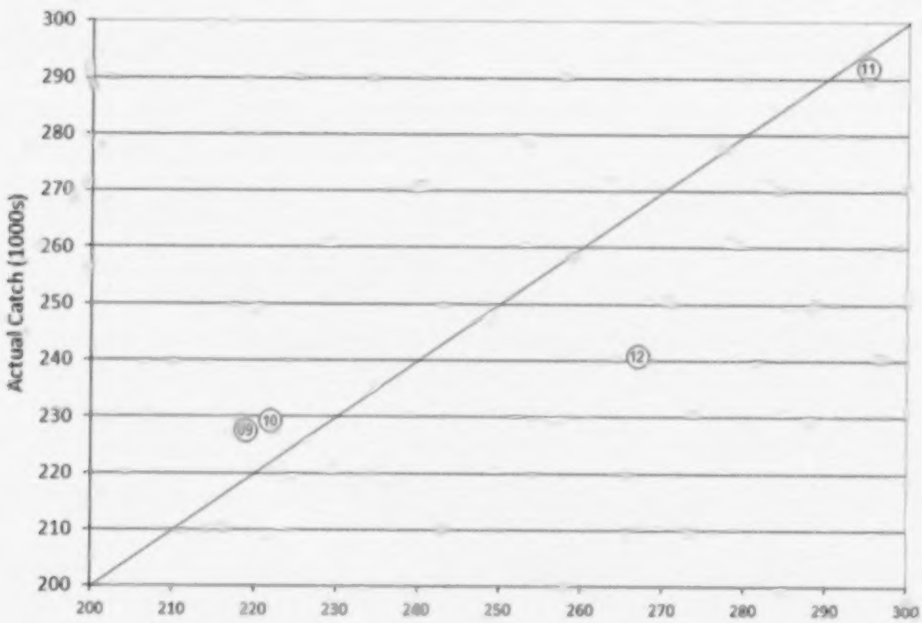


Figure 3.4 Deviations from preseason allowable catch in the SEAK AABM fishery.

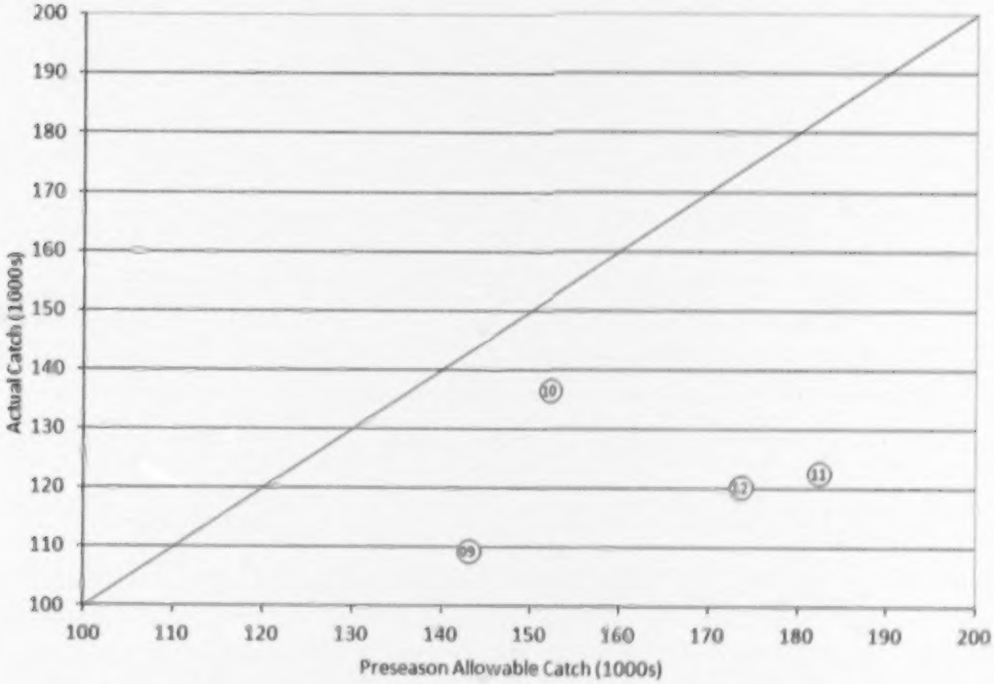


Figure 3.5 ***Deviations from preseason allowable catch in the NBC AABM fishery.***

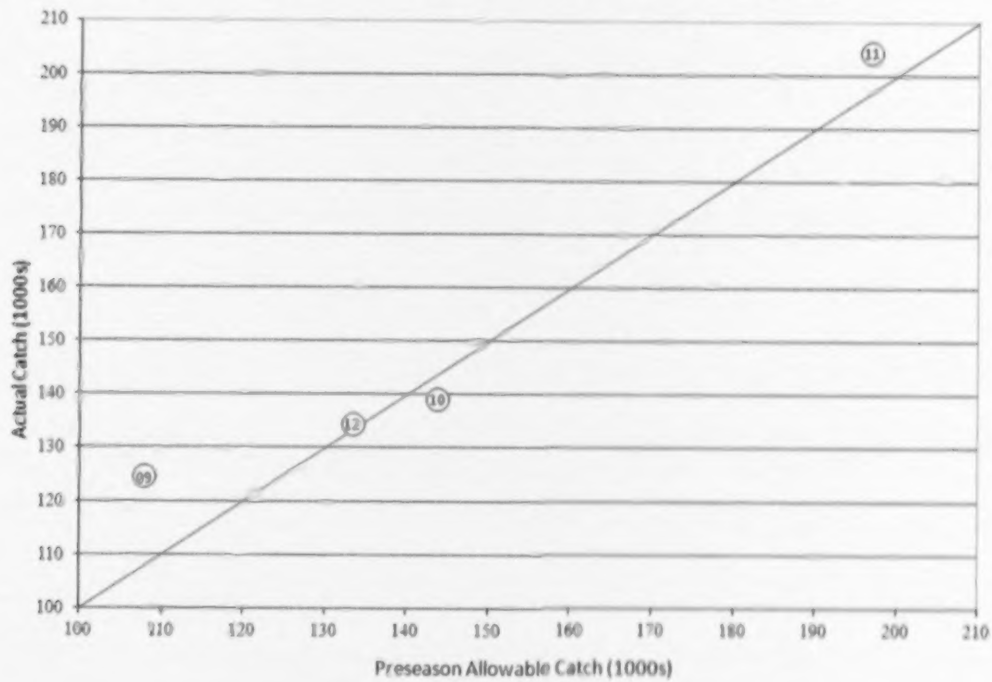


Figure 3.6 ***Deviations from preseason allowable catch in the WCVI AABM fishery.***

3.2.2.2 *Stock composition of abundances available in AABM fisheries, 1979–2013*

The majority of catches in each AABM fishery are often comprised of only a small subset of the 30 model stocks listed in Appendix A. Figures 3.7–3.9 show the relative abundance for each major stock (resulting from CLB 1308). In general, postseason AIs had a peak during the late 1980s (1987–1989) and another in 2003 and 2004.

The major model stocks contributing to the SEAK AIs are Columbia River Upriver and Mid-Columbia Bright (URB-MCB), WCVI Natural and Hatchery, Oregon Coastal, North/Central B.C., and Fraser Early (Figure 3.7). The *Other* category is mainly Washington Coast Hatchery and Natural, Columbia River Summers, and Upper Strait of Georgia.

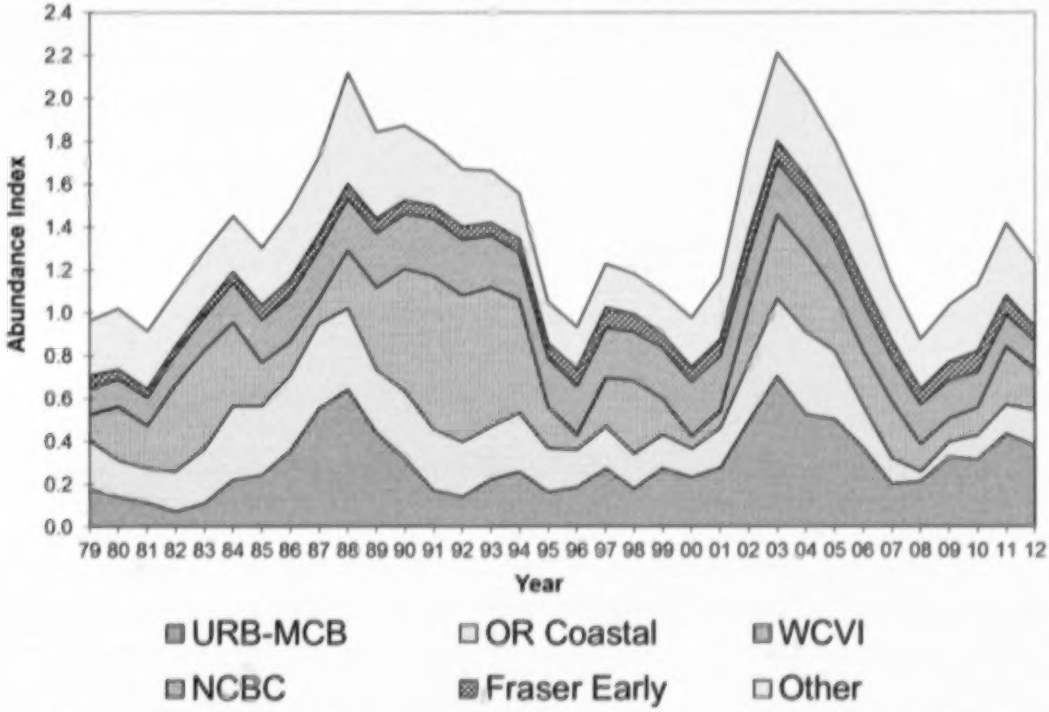


Figure 3.7 Stock composition of the annual abundance indices for the SEAK troll fishery from CLB 1309.

The major model stock groups contributing to the NBC AABM fishery AIs are Oregon Coastal, URB-MCB, WCVI Natural and Hatchery, North/Central B.C., and Fraser Early (Figure 3.8). The *Other* category consists primarily of Washington Coast Hatchery and Natural, Willamette Springs, and Upper Strait of Georgia stocks.

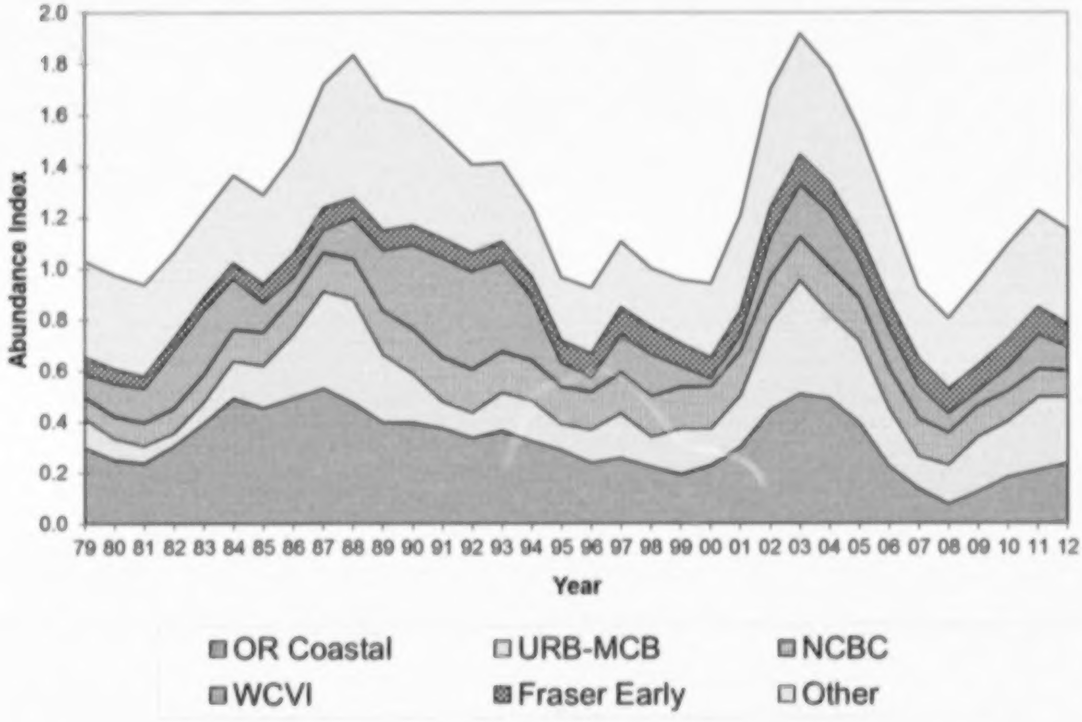


Figure 3.8. Stock composition of the abundance indices for the Northern B.C. troll fishery from CLB 1309.

The major model stock groups in the AI for the WCVI fishery are Columbia River Tules, Puget Sound, Fraser Lates, URB-MCB, and WCVI Natural and Hatchery (Figure 3.9). The *Other* category is comprised primarily of Oregon Coast, Columbia Summers, and Washington Coastal.

For model-generated stock composition details for all fisheries (AABM + ISBM), please see Appendix E.

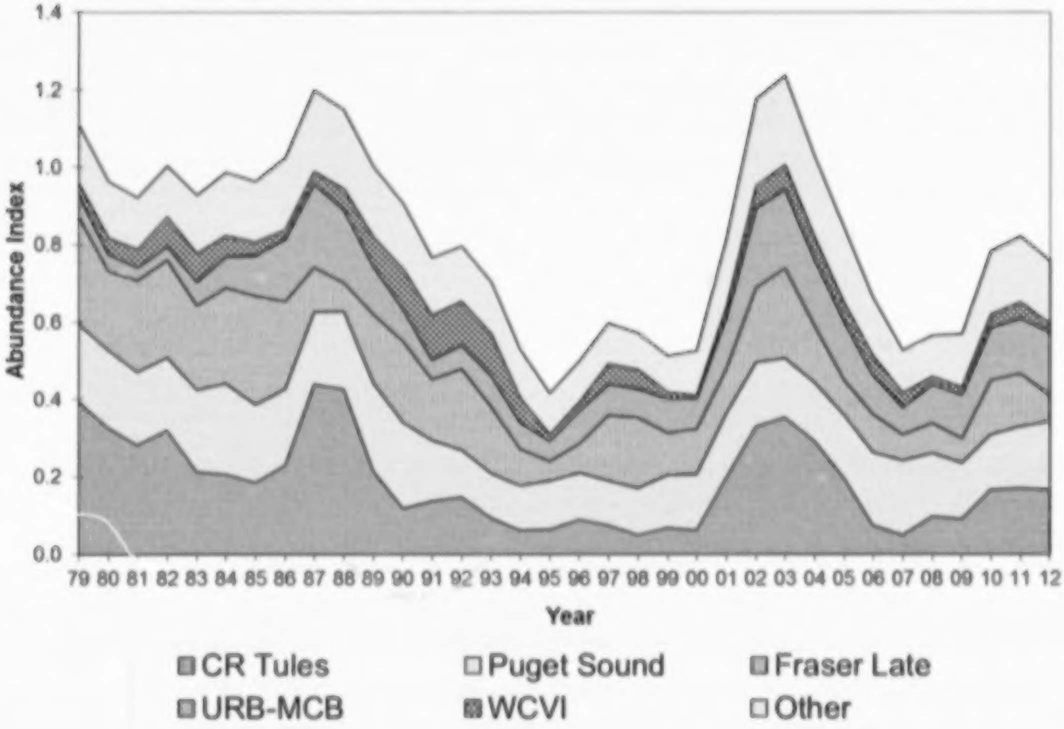


Figure 3.9. Stock composition of the abundance indices for the WCVI troll fishery from CLB 1309.

3.2.2.3 *Pre- versus Postseason AI Changes (Overages and Underages)*

Until an approach for full implementation of overage/underage provisions has been developed and accepted by the PSC, the Commissioners have instructed the CTC to track and report overages and underages relative to agreed-upon harvest objectives.

Per Treaty subparagraph 11(a)(i), AIs and associated allowable catches from the first postseason model calibration for a given fishing year are used to track catch overages and underages. Table 3.6 shows the annual differences between the postseason allowable catches and the observed catches in AABM fisheries for 1999–2012, as well as the cumulative differences. In SEAK, the 2012 catch was 17.5% above the postseason allowable catch, and the cumulative differences were 2.5% above the cumulative postseason allowable catch. In NBC, the 2012 catch was 19.5% below the preseason allowable catch and the cumulative differences were 25.1% below the cumulative postseason allowable catch. In WCVI, the 2012 catch was 18.2% above and the cumulative differences were 1.5% below the cumulative postseason allowable catch. The SEAK, NBC, and WCVI AABM fisheries have been over the preseason allowable catch 10 (SEAK), 3 (NBC), and 9 (WCVI) of the last 14 years.

Overages and underages in AABM catches, relative to the first postseason calibration for a fishing year (Table 3.6), can arise due to imprecision in the inseason management system, errors in the preseason calibration process (e.g., forecast error), or a combination of the two.

The relative influence of each was evaluated by inspecting differences in actual landed catch and allowable catches from both the preseason and postseason calibrations (Table 3.7). In 2012, regarding the inseason management system, the actual landed catch was less than the preseason allowable catch by 25,785 Chinook salmon in SEAK and by 53,293 in NBC. For WCVI, the actual landed catch was 1,168 more than the preseason allowable catch. In terms of the postseason allowable catches for evaluation of the provisions of the PST (subparagraph 11(a)(i)), actual catches exceeded the postseason allowable catches by 35,915 Chinook salmon in SEAK and by 20,668 in WCVI. Actual landed catch in NBC was 29,193 fish less than the postseason allowable catch.

Table 3.6 *Deviations in numbers of Chinook salmon caught and percentages from allowable catches derived from the postseason AI for PST AABM* fisheries *in 1999–2012. Postseason values for each year are from the first postseason calibration following the fishing year.*

	SEAK		NBC		WCVI	
Year	**Number of Fish**	**Percent Difference**	**Number of Fish**	**Percent Difference**	**Number of Fish**	**Percent Difference**
1999	14,642	7.9%	–39,374	–31.2%	–70,587	–66.0%
2000	7,993	4.5%	–91,600	–74.2%	15,238	17.7%
2001	–63,381	–25.3%	–115,400	–72.6%	–27,830	–19.1%
2002	–14,767	–4.0%	–87,663	–36.9%	–31,764	–16.1%
2003	–60,081	–13.7%	–85,543	–30.9%	–93,079	–34.6%
2004	–1,281	–0.3%[1]	–25,492	–9.5%	7,024	3.4%
	3,366	0.8%				
2005	2,936	0.8%	2,906	1.2%	22,962	12.8%
2006	6,783	1.9%	15,985	8.0%	1,383	1.0%
2007	68,789	26.5%	1,235	0.9%	17,250	14.2%
2008	19,083	12.5%	–25,253	–20.9%	8,826	6.4%
2009[2]	51,667	29.4%	–29,630	–21.3%	33,317	36.5%
2010	13,555	6.3%	–23,787	–14.8%	–3,253	–2.3%
2011	8,728	3.1%	–64,140	–34.3%	69,432	51.5%
2012	35,915	17.5%	–29,193	–19.5%	20,668	18.2%
Cum.	90,579	2.5%	–596,949	–25.1%	–30,413	–1.5%
	95,227	2.6%				

[1] The upper 2004 value resulted from subtracting a disputed terminal exclusion catch for the Stikine River in 2004. Catch accounting has since been defined in the Transboundary Agreement.

[2] This is the first catch year in which fisheries operated under the provisions of the 2009 Agreement; cumulative deviations span the entire record that is displayed.

Table 3.7 ***Deviations in actual landed catch (LC), allowable landed catch determined from preseason model calibration (PreALC), and allowable landed catch determined from postseason model calibration (PostALC) for AABM fisheries 1999–2012. Postseason values for each year are from the first postseason calibration following the fishing year. The difference between LC and PreALC represents the consequences of the management system employed in the year. The difference in PreALC and PostALC represents consequences of the forecast procedures and data used in forecasting the PreALC by the PSC Chinook Model. The difference in LC and PostALC captures the effects of both processes.***

Year	SEAK			NBC			WCVI		
	LC–PreALC	PreALC–PostALC	LC–PostALC	LC–PreALC	PreALC–PostALC	LC–PostALC	LC–PreALC	PreALC–PostALC	LC–PostALC
1999	6,042	8,600	14,642	–58,874	19,500	–39,374	–91,887	21,300	–70,587
2000	–3,407	11,400	7,993	–98,100	6,500	–91,600	–14,062	29,300	15,238
2001	–2,981	–60,400	–63,381	–89,100	–26,300	–	–23,530	–4,300	–27,830
2002	633	–15,400	–14,767	–42,563	–45,100	–87,663	–38,164	6,400	–31,764
2003	13,419	–73,500	–60,081	–5,443	–80,100	–85,543	–5,979	–87,100	–93,079
2004	33,519 38,166	–34,800 –34,800	–1,281[1] 3,366	–2,092	–23,400	–25,492	24,124	–17,100	7,024
2005	–26,064	29,000	2,936	–2,994	5,900	2,906	14,462	8,500	22,962
2006	14,483	–7,700	6,783	–7,215	23,200	15,985	–13,517	14,900	1,383
2007	–1,411	70,200	68,789	–33,765	35,000	1,235	–4,150	21,400	17,250
2008	1,983	17,100	19,083	–29,153	3,900	–25,253	–16,874	25,700	8,826
2009[2]	8,867	42,800	51,667	–33,530	3,900	–29,630	16,817	16,500	33,317
2010	7,555	6,000	13,555	–15,487	–8,300	–23,787	–4,653	1,400	–3,253
2011	–2,772	11,500	8,728	–59,740	–4,400	–64,140	7,432	62,000	69,432
2012	–25,785	61,700	35,915	–53,293	24,100	–29,193	1,168	19,500	20,668

[1] The upper 2004 value resulted from subtracting a disputed terminal exclusion catch for the Stikine River in 2004. Catch accounting has since been defined in the Transboundary Agreement.

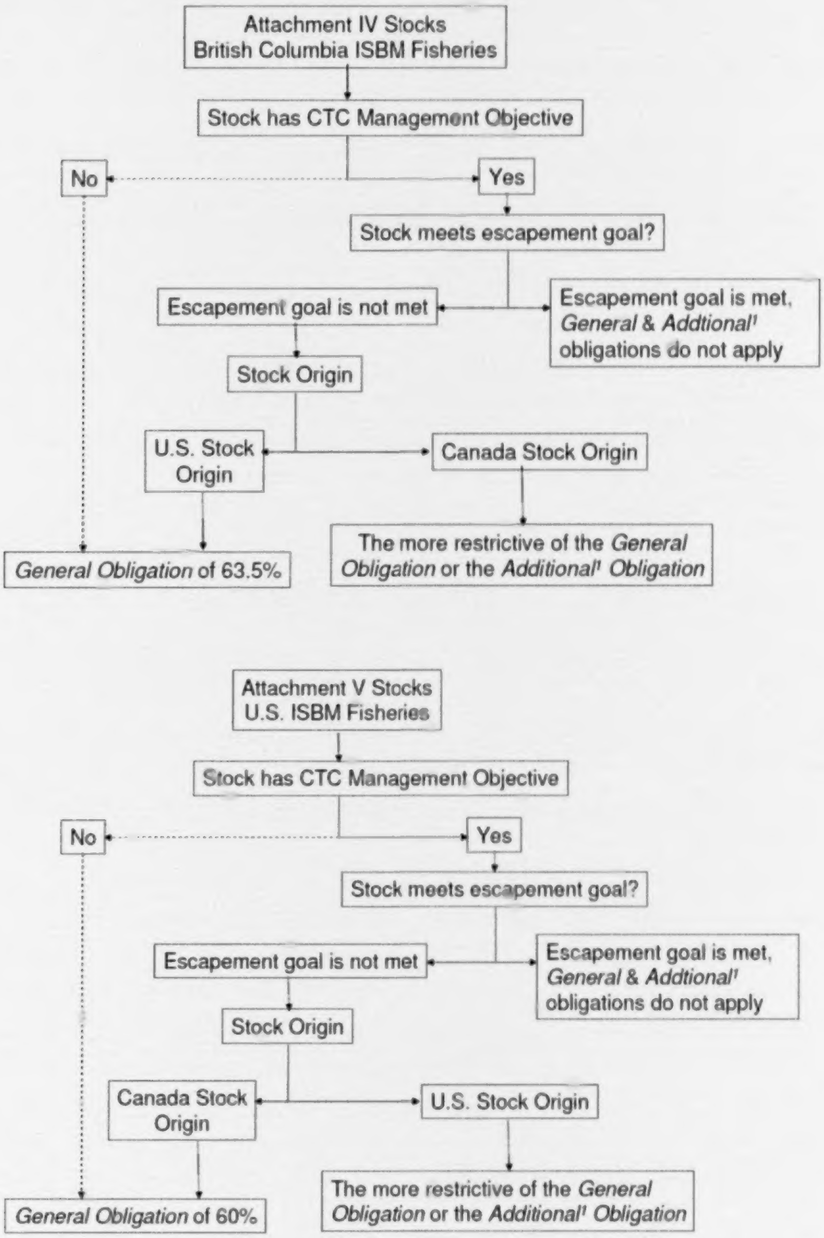
[2] This is the first catch year in which fisheries operated under the provisions of the 2009 Agreement.

3.2.3 ISBM Fishery Calibration Results

3.2.3.1 *ISBM Indices by Stock*

For ISBM fisheries, the 2009 PST Agreement specifies that Canada and the U.S. will reduce base period exploitation rates on specified stocks by 36.5% (Canada) and 40% (U.S.), equivalent to ISBM indices of 63.5% (Canada) and 60% (U.S.). This requirement is referred to as the *general obligation* and does not apply to stocks that achieve their CTC-agreed escapement goals. The Treaty also specifies that for those stocks whose general obligation is insufficient to meet the escapement goal, the Party in whose waters the stock originates shall further constrain its fisheries to an extent that is not greater than the average 1991–1996 ISBM exploitation rate (Paragraph 8 (c)). This requirement is referred to as the *additional obligation*. Comparing the general obligation to the additional obligation for stocks with CTC-agreed escapement goals is necessary if the goals are not met for ISBM fisheries harvesting stocks that spawn in the same country. Of relevance is whether or not the average 1991–1996 index value is less than the general obligation, if not, the 1991–1996 average is not applicable. Figure 3.10 shows the sequence of decisions leading to the implementation of ISBM general and additional obligations for stocks in Attachments IV and V in the 2009 Agreement.

Estimated ISBM fishery indices are shown in Table 3.8 for Canadian fisheries and Table 3.9 for U.S. fisheries. Both tables present CWT-based indices for 2011, and Chinook model-based predicted indices for 2013. The 2009 Agreement specifies that the indices be assessed postseason using the CWT-based estimates; 2011 is the most recent analysis available for all stocks (see section 3.5.3 for an analysis of a subset of ISBM fisheries/stocks for 2011). CWT-based indices for 1999–2011 and model-based indices for 1999–2013 are presented in Appendix B.



[1] The additional obligation is the average ISBM exploitation rate during 1991-1996

***Figure 3.10** Flow diagrams depicting the sequence of decisions leading to the implementation of ISBM general and additional obligations for stocks in Attachments IV and V of Chapter 3 of the 2009 PST Agreement according to Paragraph 8 of the Chinook Chapter.*

Table 3.8 ISBM indices based on 2011 and 2013 PSC Chinook Model, 2011 CWT analysis and the 2013 indices predicted from the 2013 PSC Chinook Model for the stock groups applicable to all B.C. ISBM fisheries as listed in Attachment IV of the Treaty.

Stock Group	Escapement Indicator Stock	2011 Model Indices for 2011	2013 Model Indices for 2011	CWT Indices for 2011	2013 Model Indices for 2013
Lower Strait of Georgia	Cowichan[1]	0.367	0.227[2]	0.147[3]	0.362[2]
	Nanaimo	NA		NA[4,5]	
Fraser Late	Harrison River[1]	0.193	0.261	0.092[6]	0.286
North Puget Sound Natural Springs	Nooksack	0.732	0.208	0.014	0.273
	Skagit	0.731	0.208	NA	0.273
Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	0.578	0.165	0.032	0.649
Fraser Early (Spring and Summers)	Upper Fraser, Mid Fraser, Thompson	0.222	0.110	NA	0.238
West Coast Vancouver Island Falls	WCVI (Artlish, Burman, Kauok, Tahsis, Tashish, Marble)	0.491	0.778	0.650	0.227
Puget Sound Natural Summer Falls	Skagit	0.745	0.174	NA	0.429
	Stillaguamish	0.793	0.247	0.246	0.561
	Snohomish	0.744	0.175	NA	0.423
	Lake Washington	0.752	0.225	NA	0.419
	Green River	0.756	0.225	0.300	0.419
North/Central B.C.	Yakoun, Nass, Skeena, Area 8	0.598	0.163	NA	0.496

[1] Stock or stock group with a CTC-agreed escapement goal.

[2] Although model-based indices were previously calculated separately for Cowichan and Nanaimo, these did not adequately represent impacts on either Lower Strait of Georgia stock because the model-based data represent an aggregate of the two stocks and methods do not currently exist to correctly disaggregate these data for calculation of the ISBM values. Until such methods are developed, a single index value only will be reported representing the aggregate.

[3] An inconsistency was discovered between the approaches used to calculate the model-based and CWT-based indices. The former included harvest rates for terminal sport while the latter did not. Terminal sport harvest rates are now included in the calculation of both indices. Further review is yet required to determine whether the base period terminal sport harvest rates obtained from analyses of Big Qualicum CWT recoveries adequately represent impacts that would have occurred on Cowichan Chinook.

[4] Not available (NA) because of insufficient data (lack of stock-specific tag codes, base period CWT recoveries, etc).

[5] Several problems have been identified in the approach previously used to calculate the CWT-based indices for Nanaimo Chinook. Until these problems are resolved, indices for this stock will not be reported.

[6] The terminal sport harvest rates for Chilliwack Hatchery Chinook, the indicator stock, were removed from the calculation for the Harrison River naturals because sport harvest has been essentially zero on the natural population.

Table 3.9 ISBM indices based on 2011 and 2013 PSC Chinook Model, 2011 CWT analysis and the 2013 indices predicted from the 2013 PSC Chinook Model for the stock groups applicable to all Southern U.S. fisheries as listed in Attachment V of the Treaty.

Stock Group	Escapement Indicator Stock	2011 Model Indices for 2011	2013 Model Indices for 2011	CWT Indices for 2011	2013 Model Indices for 2013
Washington Coastal Fall Naturals	Hoko	0.419	1.505	NA[1]	0.608
	Grays Harbor	0.549	0.765	0.923	0.547
	Queets[2]	0.327	0.565	NA	0.532
	Hoh[2]	0.760	0.437	2.003	0.802
	Quillayute[2]	1.058	1.469	NA	1.442
Columbia River Falls	Upriver Brights[2]	0.841	1.129	2.862	0.971
	Deschutes[2]	1.044	0.687	0.798	0.718
	Lewis[2]	0.426	0.760	0.432	0.538
Puget Sound Natural Summer Falls	Skagit	0.789	NC[3]	NA	1.015
	Stillaguamish	0.169	NC	0.195	0.213
	Snohomish	0.211	NC	NA	0.231
	Lake Washington	0.387	NC	NA	0.404
	Green River	0.236	NC	0.439	0.331
Fraser Late	Harrison River[2]	0.497	0.542	NA	0.887
Columbia River Summers	Mid-Columbia Summers[2]	1.398	1.795	5.376	1.571
Far North Migrating Oregon Coastal Falls	Nehalem[2]	2.146	1.376	1.210	1.475
	Siletz[2]	0.643	1.105	1.068	0.679
	Siuslaw[2]	1.427	1.240	1.108	1.443
North Puget Sound Natural Springs	Nooksack	0.484	NC	0.741	0.330
	Skagit	0.271	NC	NA	0.337

[1] Not available (NA) because of insufficient data (lack of stock-specific tag codes, base period CWT recoveries, etc).
[2] Stock with a CTC-agreed escapement goal.
[3] Not able to calculate (NC) from 2013 Fisheries Regulation Assessment Model harvest projections.

3.2.3.2 *CWT-based Indices in 2011*

Figures 3.11 and 3.12 show the historical ISBM indices based on CWT recoveries from 1999 to 2011. The ISBM fishery restrictions do not apply to stocks meeting CTC-agreed escapement goals. However, should an escapement goal not be met, then the general obligation or the additional obligation (1991–1996 ISBM rate average for the Party in whose waters the stock not meeting escapement goal originates), whichever is lesser (Figure 3.10), needs to be achieved.

Six of the seven Canadian ISBM indices that could be calculated for 2011 from CWT data were reduced more than required under the 2009 Agreement. The WCVI CWT-based ISBM index (0.650) slightly exceeded the general obligation rate (0.635). Since there is no CTC-agreed escapement goal for this stock aggregate, the general obligation applies (Table 3.10). We identified several inconsistencies in the way these indices have been computed in the past, as noted in Table 3.8 footnotes. Most inconsistencies were between model and CWT exploitation rate based methods of calculating ISBM indices. In the case of Lower Strait of Georgia, Nanaimo was dropped from the CWT-based index because of concern about the method for estimating the terminal fishery rates. Nanaimo and Cowichan stocks are no longer reported separately in the model-based index because a way to split the two stocks in the base period has not yet been developed.

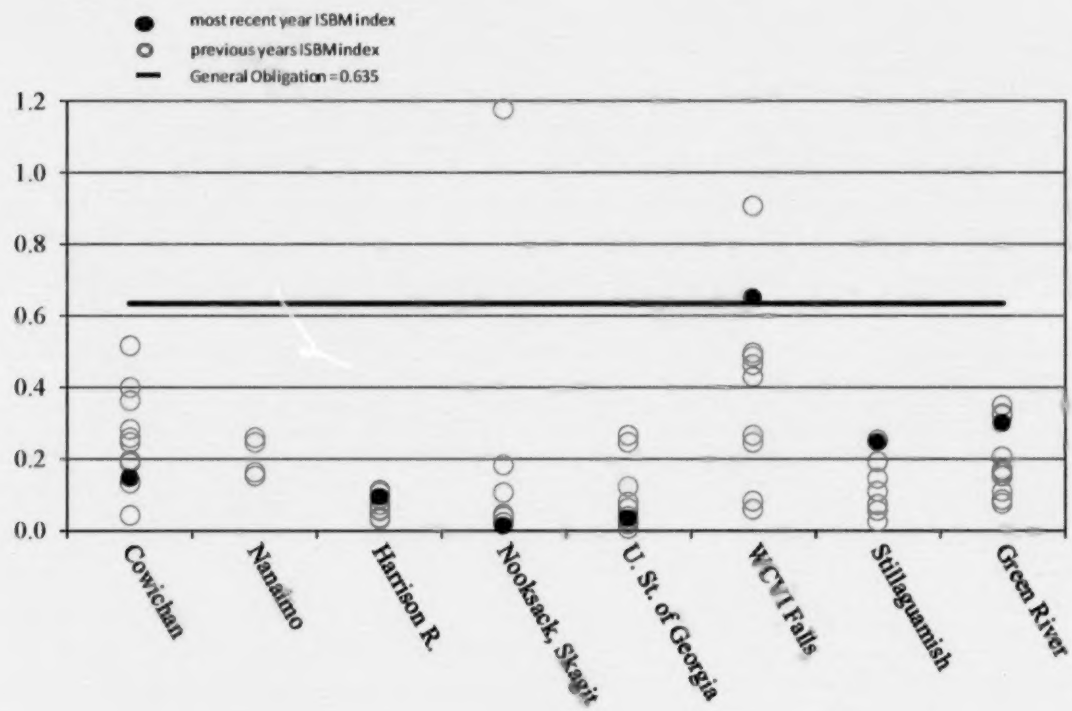


Figure 3.11. CWT-based ISBM indices for B.C. fisheries for 1999–2011. ISBM Index for Nanaimo has not been computed since 2003.

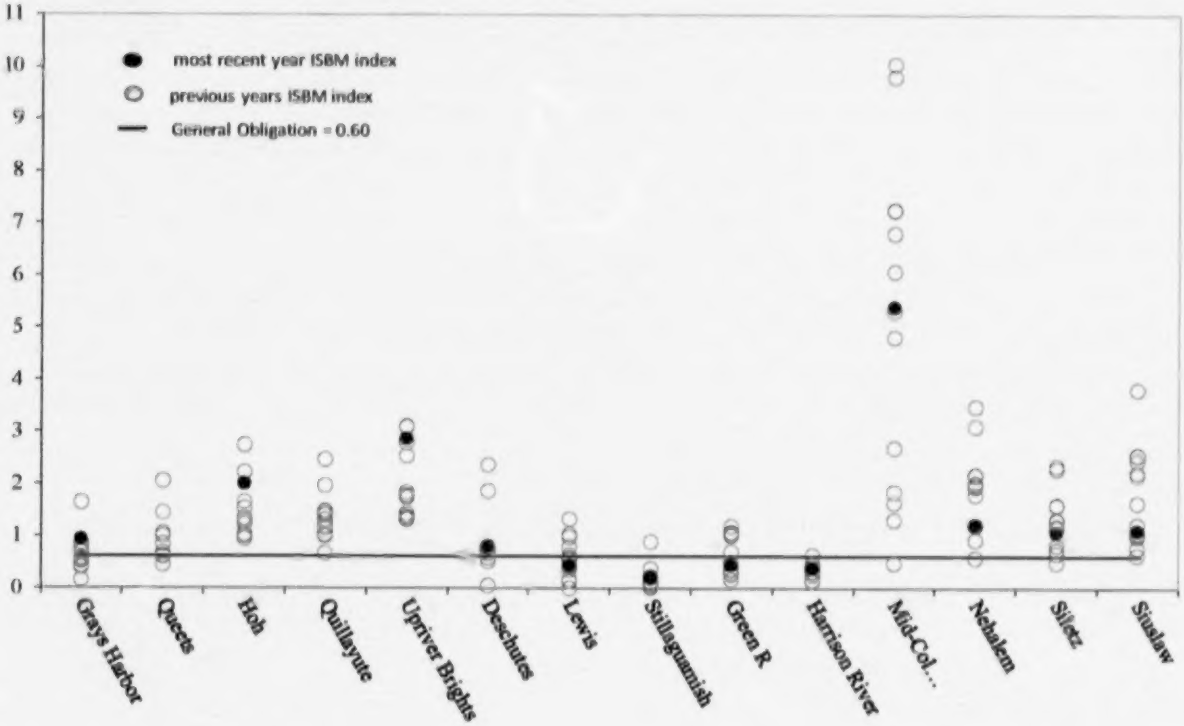


Figure 3.12. CWT-based ISBM indices for Southern U.S. fisheries for 1999–2011. Index for 2011 could not be computed for Queets and Quillayute.

Table 3.10 Review of performance in the Canadian ISBM fishery, 2011.

Stock	CTC Goal	2011 Escapement	Goal met?	Obligation[1]	2011 CWT Index	Compliance under Treaty[2]
Cowichan	6,500	3,492	No	0.621	0.147	Yes
Nanaimo	–	–	–	0.635	NA[3]	NA
Harrison	75,100	123,647	Yes	0.250	0.092	Yes
Nooksack	–	–	–	0.635	0.014	Yes
Skagit	–	–	–	0.635	NA	NA
Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	–	–	–	0.635	0.032	Yes
Upper Fraser, Mid Fraser, Thompson	–	–	–	0.635	NA	NA
Artlish, Burman, Kauok, Tahsis, Tashish, Marble	–	–	–	0.635	0.650	No
Skagit	–	–	–	0.635	NA	NA
Stillaguamish	–	–	–	0.635	0.246	Yes
Snohomish	–	–	–	0.635	NA	NA
Lake Washington	–	–	–	0.635	NA	NA
Green	–	–	–	0.635	0.300	Yes
Yakoun, Nass, Skeena, Area 8	–	–	–	0.635	NA	NA

[1] General obligation (0.635) or additional obligation (1991-1996 ISBM rate average for the Party in whose waters the stock not meeting escapement goal originates), whichever is lower, for stocks listed in Annex 4, Chapter 3, Attachment IV.
[2] Annex 4, Chapter 3, Paragraph 8.
[3] NA = Not available.

Three of the 12 U.S. ISBM indices for the CWT-based estimates for 2011 were reduced more than required under the obligations specified in Paragraph 8 of the Chinook Chapter. The other nine U.S. CWT-based ISBM indices exceeded either the general obligation or the additional obligation (Table 3.11). Seven of these stocks have agreed escapement goals and they all met or exceeded their respective escapement goals, and thus are exempted from the general obligation. Both Nooksack and Grays Harbor ISBM indices also exceeded the general obligation. Since there are no CTC-agreed escapement goals for either of these stocks, the general obligation applies.

Table 3.11 Review of performance in the U.S. ISBM fishery, 2011.

Stock	CTC Goal	2011 Escapement	Goal met?	Obligation[1]	2011 CWT Index	Compliance under Treaty[2]
Hoko	–	–	–	0.600	NA[3]	NA
Grays Harbor	–	–	–	0.600	0.923	No
Queets	2,500	3,928	Yes	0.600	NA	Yes
Hoh	1,200	1,293	Yes	0.600	2.003	Yes
Quillayute	3,000	3,963	Yes	0.600	NA	Yes
Brights	40,000	130,395	Yes	0.600	2.862	Yes
Deschutes	4,532	17,117	Yes	0.431	0.798	Yes
Lewis	5,700	8,009	Yes	0.588	0.432	Yes
Skagit	–	–	–	0.600	NA	NA
Stillaguamish	–	–	–	0.600	0.195	Yes
Snohomish	–	–	–	0.600	NA	NA
Lake Washington	–	–	–	0.600	NA	NA
Green	–	–	–	0.600	0.439	Yes
Harrison	75,100	123,647	Yes	0.600	NA	Yes
Col. R. Summers	12,143	44,432	Yes	0.600	5.376	Yes
Nehalem	6,989	7,665	Yes	0.600	1.210	Yes
Siletz	2,944	3,638	Yes	0.600	1.068	Yes
Siuslaw	12,925	30,713	Yes	0.600	1.108	Yes
Nooksack	–	–	–	0.600	0.741	No
Skagit	–	–	–	0.600	NA	NA

[1] General obligation (0.600) or additional obligation (1991-1996 ISBM rate average for the Party in whose waters the stock not meeting escapement goal originates), whichever is lower, for stocks listed in Annex 4, Chapter 3, Attachment V

[2] Annex 4, Chapter 3, Paragraph 8.

[3] NA = Not available.

3.2.3.3 *Predicted ISBM Indices for 2013*

Of the 13 ISBM indices for Canada, only the index for Upper Strait of Georgia was predicted to exceed the general obligation of 0.635 for Canadian ISBM fisheries in 2013 based on output from CLB 1308 (Table 3.8). Since there is no CTC-agreed escapement goal for this stock aggregate, the general obligation would apply. Among the stocks with agreed escapement goals, the ISBM index for Harrison was predicted to exceed the additional obligation of 0.250.

Of the 13 ISBM indices for Canada, only the index for Upper Strait of Georgia is predicted to exceed the general obligation of 0.635 for Canadian ISBM fisheries in 2013 based on output from CLB 1308 (Table 3.8). Since there is no CTC- agreed escapement goal for this stock aggregate, the general obligation applies. Among the stocks with agreed escapement goals, the ISBM index for Harrison is predicted to exceed the additional obligation of 0.250.

Eleven of the 20 U.S. ISBM indices are predicted to be above the general obligation of 0.60 or the additional obligation for U.S. ISBM fisheries in 2013 based on CLB 1308 (Table 3.9). Where relevant, all of the corresponding stocks except Fraser Late are expected to meet their CTC-agreed escapement goals.

3.2.3.4 *CWT ISBM Indices for 2012*

One of the limitations of the current ISBM indices relates to delayed data availability (CTC 2011). The data needed to calculate the postseason ISBM CWT-based index for several stocks caught in U.S. ISBM fisheries are not available at the time the index must be computed for reporting. Catch estimates from some U.S. ISBM fisheries may not be available until at least one year after a fishery has occurred, either because the catch data are unavailable or because multiple agencies have not reached timely agreement on the *final* catch estimates needed to generate expansion factors for CWT recoveries. For example, sport harvest estimates for Washington and Oregon are based on punch cards filled in by the fishers and returned by mail more than a year after the fisheries have been completed. Because the sport catch estimates are needed to estimate cohort sizes, the consequence of these delays in some U.S. fisheries is that the ISBM indices for both countries may not be computed within the timeframe needed for ISBM evaluations to inform fishing plans for the upcoming season. Each agency's procedures for sampling fisheries for CWTs, decoding CWTs, and data management, generally meet the timelines necessary for the CTC to develop the ISBM indices. However, the catch estimates that are necessary to expand the CWT sample data and some of the escapement CWT samples are not available on time for some Washington and Oregon sport and net fisheries.

One of the recommendations of the CTC's ISBM workgroup was that if late CWT data reporting issues are irresolvable for some U.S. ISBM fisheries, then estimation models should be developed and reviewed so the CTC can report the ISBM indices in time to use for the preseason management process for the next season (CTC 2011). Reducing the two-year time lag for CWT-based indices is highly desirable and possible for some Canadian stocks with timely available catch and CWT recovery data. The computation of CWT-based ISBM indices for year 2012 was possible for four Canadian stocks; these values are shown in Table 3.12. ISBM indices for stock groups Lower Strait of Georgia, Fraser Late, and Upper Strait of Georgia were below the general obligation. The CWT-based indices for both Lower and Upper Strait of Georgia were within the range observed from 1999 to 2011, and relatively close to the period average whereas the ISBM index for Fraser Late exceeded the previous maximum observed of 0.134 in 2010. The 2011 CWT index value for the WCVI stock group was greater than the general obligation and substantially larger than the index average for 1999–2011. There is a precedent of a higher CWT-based ISBM index value (0.906) for this stock group in 2007.

Fraser Late is the only Canadian stock included in Attachment V in the 2009 Agreement corresponding to U.S. ISBM fisheries. However, the U.S. CWT-based indices for Fraser Late have not been reported from 2005 onward because they do not accurately reflect the impacts on the natural stock. A considerable proportion of the recoveries in U.S. fisheries have occurred in MSFs in which only clipped hatchery-origin fish are retained. The U.S. indices since 2005 indicate greater impacts than would have occurred on the natural stocks and are no longer being reported.

Table 3.12 2012 Canadian CWT-based ISBM indices for Canadian stock groups based on 2013 CWT analysis, their average CWT index values for 1999–2011, model-based ISBM indices for 2012, and the average model values for 1999–2013. Values in parentheses represent standard deviations.

Stock Group	Escapement Indicator Stock	Canadian ISBM			
		CWT Indices 2012	CWT Indices Average (1999–2011)	Model Indices 2012	Model Indices Average (1999–2013)
Lower Strait of Georgia	Cowichan	0.231	0.253 (0.123)	0.443	0.393 (0.133)
Fraser Late	Harrison River	0.183	0.070 (0.034)	0.256	0.292 (0.133)
Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	0.067	0.091 (0.088)	0.596	0.438 (0.269)
West Coast Vancouver Island Falls	WCVI (Artlish, Burman, Kauok, Tahsis, Tashish, Marble)	0.738	0.399 (0.246)	0.636	0.533 (0.400)

3.2.3.5 *Paragraph 13 (d) and (e) analysis*

Paragraph 9 of the 1999 Agreement was rewritten in 2009 as paragraph 13 and now describes a process to implement additional management actions in fisheries if the management as prescribed in paragraphs 8 and 10 fail to meet maximum sustainable yield or other biologically based escapement objectives. Paragraph 13 currently details a process for evaluating stock groups and indicator stocks listed in Attachments I–V to determine if additional management actions should be implemented in relevant AABM and ISBM fisheries. The stock groups and indicator stocks that correspond to the SEAK, NBC and WCVI AABM fisheries are listed in Attachments I (SEAK), II (NBC), and III (WCVI AABM). Additional reductions in the WCVI AABM fishery will only be taken if agreed to by the Commission. If additional management action is required in the SEAK or NBC AABM fisheries, the ISBM fisheries harvesting the stocks listed in Attachments IV and V would commensurably be reduced, thus increasing the escapements of the depressed stocks within the stock groups triggering the additional AABM management actions. A flow diagram depicting the criteria needed to trigger additional management action was reported in the CTC's evaluation of ISBM metrics (CTC 2011). The CTC is to notify the Commission of any required fishery restrictions to be implemented under Paragraph 13 at the February annual meeting.

Additional management actions for SEAK or NBC AABM fisheries would reduce Table 1 catch limits by 10% if a majority of stocks with agreed management objectives in two of the stock groups listed in Attachment I or II of the Chinook Annex met one of the following conditions: at least 15% below their escapement objectives for the past year and forecast to be at least 15% below their escapement goal objectives in the upcoming year, or at least 15% below their

escapement objectives for the past two consecutive years (unless a forecast for escapement will exceed the escapement objective in the coming year).

If three or more stock groups in Attachments I or II meet the criteria to trigger additional management action, Table 1 catch limits in the relevant AABM fishery would be reduced by 20%.

Paragraph 13(d) and 13(e) focus on the evaluation of ISBM obligations (see section 3.2.3.1. ISBM Indices by Stock) with respect to AABM management actions. These new components of the 2009 Agreement may trigger additional management action in an AABM fishery when the majority of indicator stocks within a stock group do not achieve their escapement objectives for the past two consecutive years. Paragraph 13(d) and 13(e) call for an evaluation of the effect of interactions between AABM and ISBM fisheries on observed spawning escapements and a determination of whether an indicator stock would have exceeded 85% of its escapement goal if ISBM obligations were met.

Paragraph 13(d) involves an evaluation of whether the indicator stock exceeded 85% of its escapement goal because ISBM fisheries in the jurisdiction that the stock originated were constrained beyond the ISBM obligations. In this case, the indicator stock would not meet its escapement goal, which would be considered in the process for determining if additional management action is required.

Paragraph 13(e) involves an evaluation of whether the indicator stock did not exceed 85% of its escapement goal for two consecutive years as a consequence of an ISBM fishery not meeting the general obligation listed under paragraph 8. In this case, the indicator stock would meet the escapement goal, and the indicator stock would not be involved in triggering additional management actions.

An initial evaluation of ISBM performance under paragraphs 13(d) and 13(e) was undertaken by the CTC in 2011 and reported in CTC (2011). It was demonstrated that paragraphs 13(d) and 13(e) can be quantitatively evaluated. To facilitate timely evaluation and provide efficiency, the CTC developed a computer program (Paragraph13Evaluation.exe) in 2013 to evaluate these provisions of Paragraph 13. The computer program provides detailed quantitative output for each stock and year, and a summary for all stocks with CTC-agreed goals showing whether stocks should be flagged under paragraphs 13(d) or 13(e).

The Paragraph 13(d) and 13(e) evaluation has two main data limitations. First, the computer program can only perform postseason evaluations since it uses CWT data, which are not available until at least the year after a fishery has occurred. Second, only four of the eight stock groups in Attachments I-II (North Oregon Coastal Falls, Washington Coastal Fall Naturals, Columbia River Summers, and Columbia River Falls; Table 3.13) can be evaluated because management entities have not supplied escapement goals meeting CTC- agreed data standards for the other stock groups (Upper Strait of Georgia, WCVI, NBC, and Fraser Early). For Attachment III, the Columbia River Falls, Columbia River Summers, and Fraser Late stock group can be evaluated; however, the Puget Sound Natural Summer/Falls stock group cannot because none of the five indicator stocks have CTC-agreed escapement goals.

For the purpose of enabling the Paragraph 13 evaluation program, paragraphs 13(c)(i) and

13(c)(ii) were interpreted, within the context of management actions on AABM fisheries, such that a majority is defined as at least half the stocks within a stock group (i.e., one stock within a stock group with two stocks is considered a majority).[2] The appropriate evaluation was possible from 2009 to 2011 for Far North Migrating Oregon Coastal Falls, Columbia River Falls, and Columbia River Summers, from 2009 to 2010 for Washington Coastal Fall Naturals, and from 2010 to 2012 for Fraser Late. The different evaluation timeframes are due to the late reporting of CWT data. Note that ISBM obligations for 2012 cannot be calculated for most Oregon and Washington stocks until 2014 because of the delay in reporting CWT data for some southern U.S. monitoring programs.

The evaluation of paragraphs 13(d) and 13(e) provisions found that none of the indicator stocks or stock groups met the conditions requiring additional management actions. The evaluation for Washington Coastal Falls, Columbia River Falls, and Columbia River Summers showed that annual evaluations were based on 13(d) because escapements exceeded 85% of the corresponding escapement goals. For the North Oregon Coastal Falls stock group the evaluations were mostly based on 13(d) with 13(e) being used for the Nehalem in 2009 and 2010. The evaluation for the Fraser Late stock group was based on paragraph 13(d) in 2011 and 13(e) in 2012.

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[2] It is important to note that this definition of a majority is solely for the purpose of running the computer program; a definition of majority of stocks would require a policy decision. This situation was not encountered for stock groups in Attachments I–III.

Table 3.13 Evaluation of paragraphs 13(d) and 13(e) provisions for stock groups and indicator stocks listed in Attachments I and II of the 2009 Agreement. The last column shows whether criteria were met for additional management actions (AMA) based on the evaluation for the last two years with data.

Stock Group	Indicator Stock	CTC Goal	13(d) or 13(e)	2009	2010	2011	AMA (last 2 years)
North Oregon Coastal Falls							No
	Nehalem	Yes	>85% Goal & 13(d)	NA	NA	No	
			<85% Goal & 13(e)	Yes	No	NA	
	Siletz	Yes	>85% Goal & 13(d)	No	No	No	
			<85% Goal & 13(e)	NA	NA	NA	
	Siuslaw	Yes	>85% Goal & 13(d)	No	No	No	
			<85% Goal & 13(e)	NA	NA	NA	
Columbia River Summers							No
	Mid-Col	Yes	>85% Goal & 13(d)	No	No	No	
			<85% Goal & 13(e)	NA	NA	NA	
Columbia River Falls							No
	Up River Brights	Yes	>85% Goal & 13(d	No	No	No	
			<85% Goal & 13(e)	NA	NA	NA	
	Deschutes	Yes	>85% Goal & 13(d	No	No	No	
			<85% Goal & 13(e)	NA	NA	NA	
	Lewis	Yes	>85% Goal & 13(d	No	No	No	
			<85% Goal & 13(e)	NA	NA	NA	
Washington Coastal Falls							No
	Hoko	No	-	-	-	-	
	Grays Harbor	No	-	-	-	-	
	Queets	Yes	>85% Goal & 13(d	No	No	-	
			<85% Goal & 13(e)	NA	NA	-	
	Quillayute	Yes	>85% Goal & 13(d	No	No	-	
			<85% Goal & 13(e)	NA	NA	-	
	Hoh	Yes	>85% Goal & 13(d	No	No	-	
			<85% Goal & 13(e)	NA	NA	-	

3.2.4 Model Verification and Improvement

The changes in AIs between 2012 pre- and postseason calibrations noted in Section 3.2.2 were among the greatest observed, equating to a reduction in *ca*. 100,000 allowable catch across the three AABM fisheries (Table 3.5). Model errors of this magnitude underscore the importance of routine model verification, as well as occasional targeted investigations and long-range efforts to improve the PSC Chinook Model. The reliability of Chinook Model outputs, including AI predictions, depends on a number of factors: model parameters (e.g., base period exploitation rates); model structure (e.g., spatiotemporal fishery strata); and/or the annual CWT, catch, and run-size inputs (forecast or postseason estimates) with which it is calibrated. Here, we report on annual comparisons of model and CWT fishery indices and preseason (forecast) versus postseason run sizes, and a more detailed investigation into the general influence of forecast error on AI error for the three AABM fisheries. Lastly, we briefly review ongoing, related model improvement activities.

3.2.4.1 *Evaluation of Fishery Indices*

Fishery mortality indices generated by the model can be compared to values generated from the CWT-based ERA. Model and CWT-based fishery mortality indices use the same equation, but the former are derived from model estimates of catch for all model stocks instead of CWT recovery data from specific exploitation rate indicator stocks. The CWT fishery mortality indices are considered the most accurate. Fishery indices based on reported catch and total mortality are constructed using two methods. The first method is a ratio of means (ROM) and the second is the stratified proportional fishery index (SPFI; CTC 2009a). In general, the model results are closely associated with the CWT-based indices of annual fishery exploitation rates.

3.2.4.1.1 SPFI for the SEAK AABM Fishery

The SEAK fishery mortality index from the model closely follows the trend of the CWT-derived estimate from 1979 through 1989 for both landed catch and total mortality (Figure 3.13; Figure 3.14). Between 1989 and 2000, the model estimates of both the landed catch and total mortality indices are less than the CWT-derived estimate for most years. Contrarily, since 2001, the model estimates have typically been higher. Since 1990, the model estimates also show less variability compared to the CWT-derived indices.

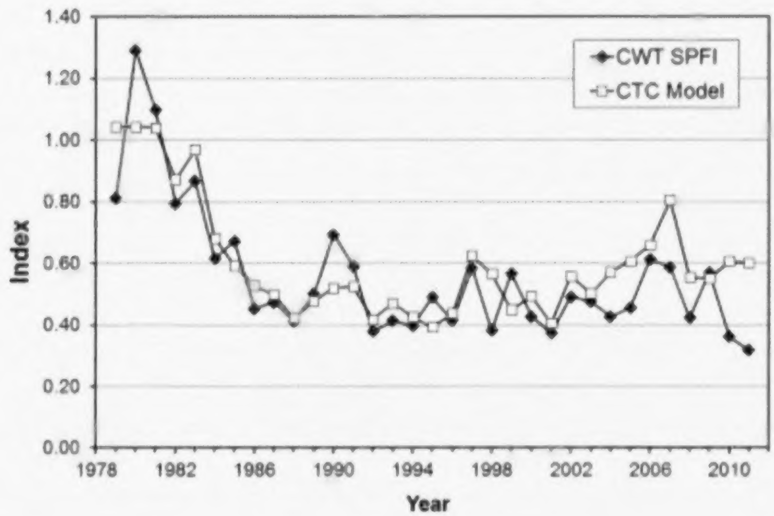

Figure 3.13. Estimated CWT-based SPFI (through 2011) and model landed catch fishery indices (through 2011) for the SEAK troll fishery.

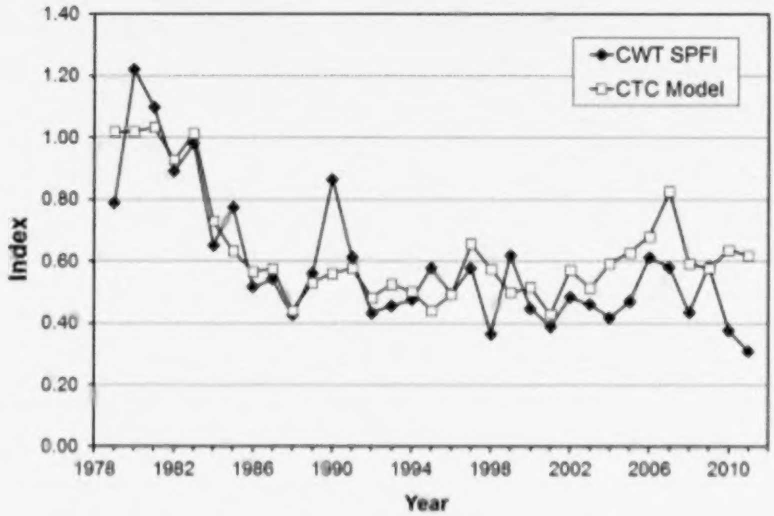

Figure 3.14. Estimated CWT-based SPFI (through 2011) and model total mortality fishery indices (through 2011) for the SEAK troll fishery.

3.2.4.1.2 SPFI developed for NBC and WCVI AABM Fisheries

Based on the results that came out of the Harvest Rate Index Analysis in 2009 (CTC 2009a), a recommendation was made to use the SPFI estimator for the fishery index in all AABM fisheries. As a result, the CTC created the SPFI for WCVI and NBC fisheries and compared them to the model and CWT-based ROM estimator of the fishery index for each of the fisheries analyzed (Figures 3.15–3.18). It should be noted that an assessment of how the SPFI affects results in the calibration procedures was originally intended to be included in this report. This analysis has been deferred until a new base calibration is completed.

The model-derived fishery mortality indices for NBC generally follow the same trend as CWT-derived indices (Figures 3.15–3.16). However, since 1991, the model-based estimates have exceeded the CWT-derived estimates in all but three years for both landed catch and total mortality indices. Since 2001, this difference has been noticeably large.

Since the base period, the model-derived landed catch fishery index estimates and trends for the WCVI troll fishery have been similar to CWT-based ROM FI estimates (Figures 3.17–3.18). Starting in 2000, model and CWT-based ROM estimates have diverged significantly for both landed catch and total mortality, with the CWT indices being consistently higher than model indices. To adjust for this the SPFI was developed that captures temporal and spatial changes in the fishery, and is now reported along with the ROM FI (Figures 3.17–3.18).

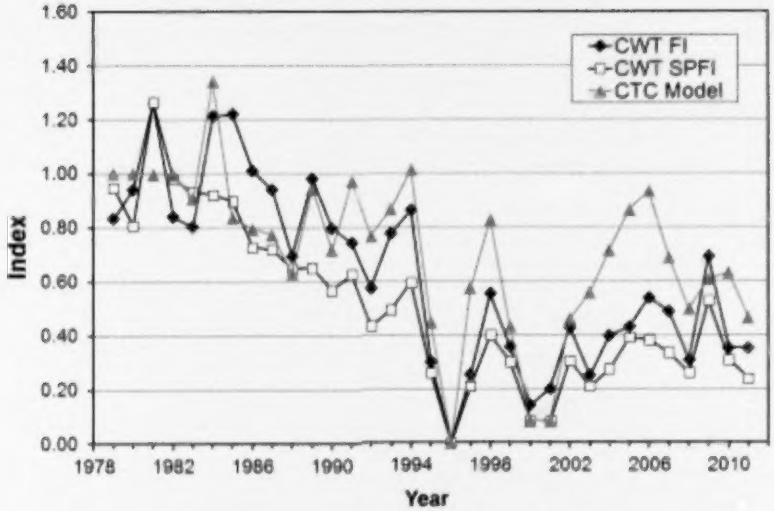

Figure 3.15. Estimated CWT ROM (FI), SPFI (through 2011) and model landed catch fishery indices (through 2011) for the NBC troll fishery.

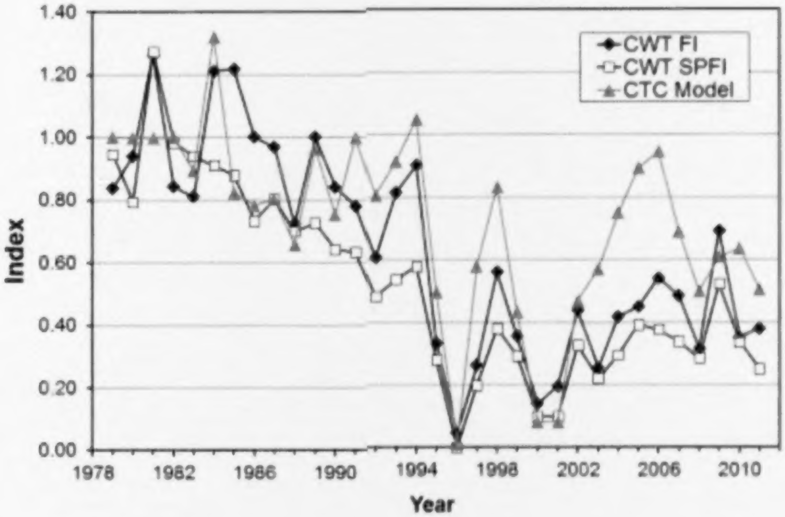

Figure 3.16. Estimated CWT ROM (FI), SPFI (through 2011) and model total mortality fishery indices (through 2011) for the NBC troll fishery.

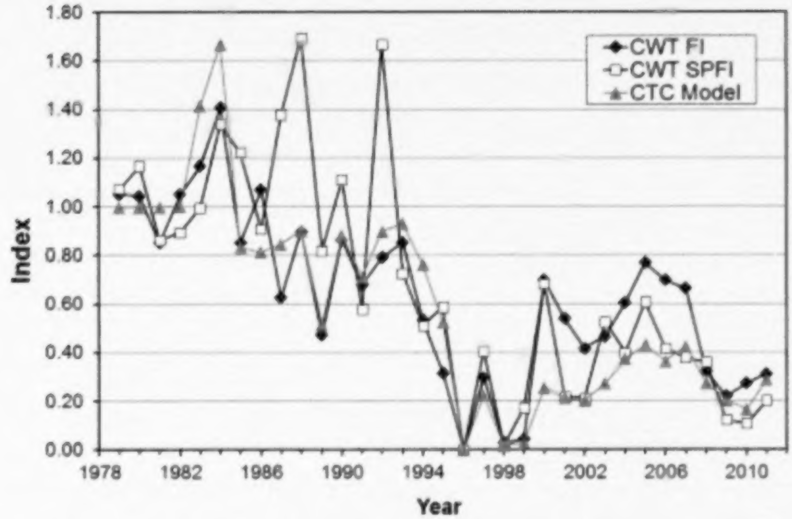

Figure 3.17. Estimated CWT ROM (FI), SPFI (through 2011) and model landed catch fishery indices (through 2011) for the WCVI troll fishery.

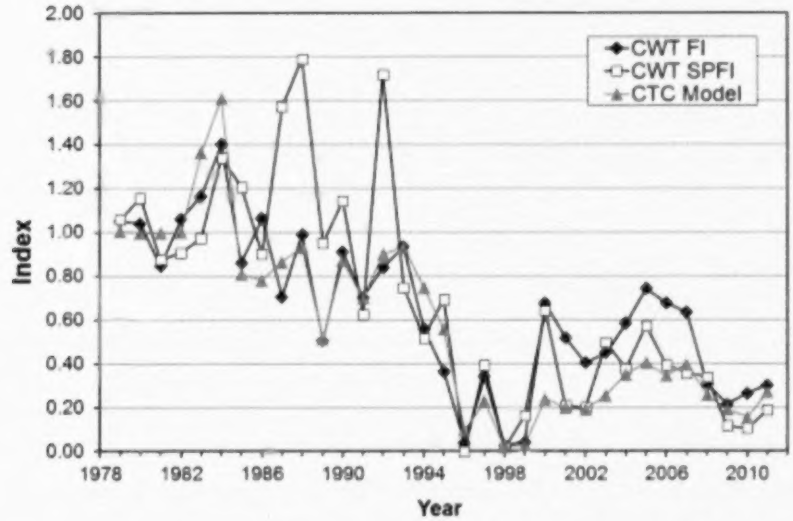

Figure 3.18. Estimated CWT ROM (FI), SPFI (through 2011) and model total mortality fishery indices (through 2011) for the WCVI troll fishery.

3.2.4.2 *Stock Forecasts used in the Model*

A summary of model-produced and agency-produced forecasts during 1999–2013 is shown in Figure 3.19 and Appendix J. The relationship between the model indicator stocks and exploitation rate indicator stocks and PST Annex stocks are shown in Appendix A. A major factor influencing the ability of the model to predict Chinook salmon abundance in AABM fisheries is the ability of the model to predict the returns of Chinook salmon (in terms of ocean escapement or spawning escapement) in the forecast year. During model calibration, agency forecasts are input to the model for all model stocks for which model forecasts are available. Thus, for model stocks with external forecasts, the variation between model forecasts and actual returns can be broken into two parts: the ability of the model to match the agency forecasts used as inputs to the model, and the ability of the agency forecasts to accurately predict the actual return of Chinook salmon in the upcoming year. In the Appendix J forecast tables, the column labeled *Model Fcst/Agency Fcst* shows the ratio of the model prediction and the agency forecast as a percentage. The column labeled *Agency Fcst/Postseason* shows the ratio of the agency forecast and the actual return as a percentage. The column labeled *Model Fcst/Postseason* shows the ratio of the return predicted by the model and the actual return as a percentage. A value of 100% would indicate that the predicted and actual values were the same.

The model forecasts are similar to the agency forecasts on average. This result is strongly influenced by the incorporation of the agency forecasts into the model calibration procedure. The average percent error of all *Model Fcst/Agency Fcst* is –1.5%. For agency forecasts versus postseason run sizes, the average percent error is –7.6%. The average percent error for model forecasts versus postseason run sizes was –11.0%.

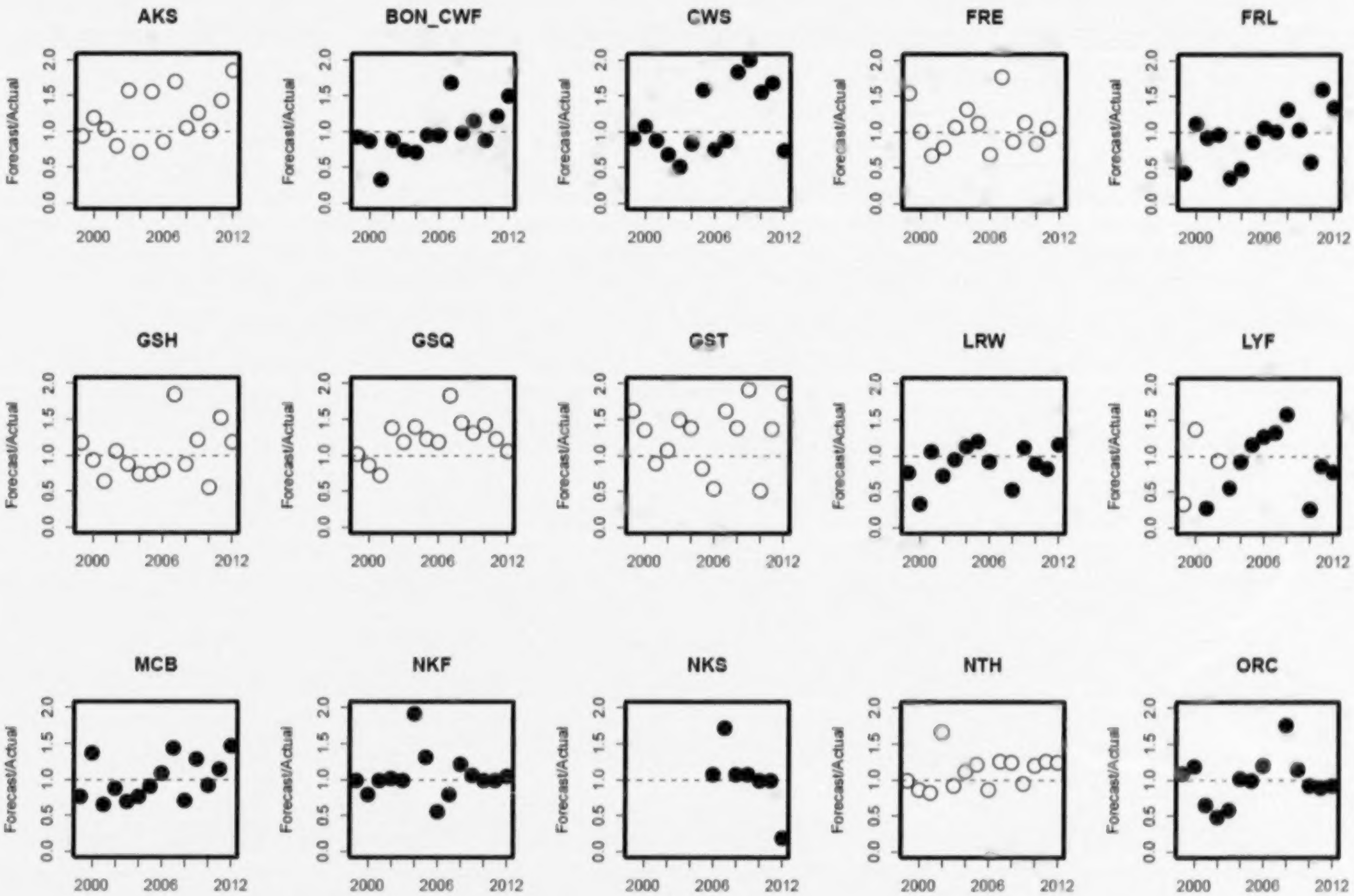

Figure 3.19 Forecast performance (Forecast/Actual) plots for PSC Chinook Model stocks.

Note: Black symbols correspond to years when calibrations were based on agency forecasts, white symbols correspond to years when model-generated forecasts were used. Stock abbreviations follow those defined in Appendix J.

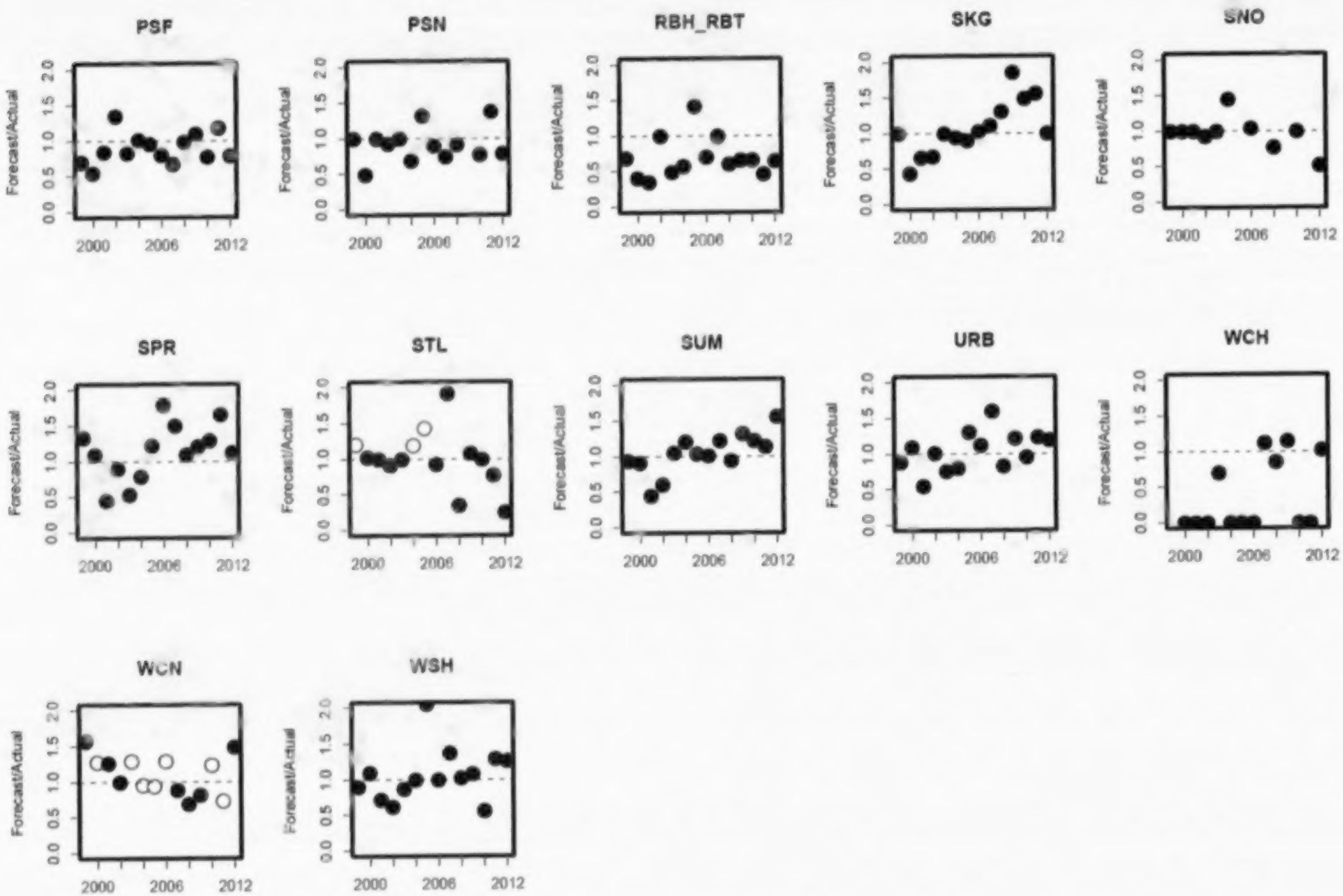

Figure 3.19 Page 2 of 2.

3.2.4.3 *Influence of Forecast Error on Pre- versus Postseason AI changes*

Within the PST Chinook management cycle, AI prediction is the key piece of data used to determine the preseason estimates of the allowable catches for each of the AABM fisheries. The Parties rely upon the CTC Model to generate annual estimates of abundance. Three sources of error in preseason AIs are currently identified as (1) error in agency forecasts of escapement or terminal run supplied for model calibration, (2) assumptions about maturation rates and survival rates used in the model calibration, and (3) model error. Each year, the CTC Model is calibrated, incorporating preseason abundance forecasts with the latest information on catches, exploitation rates, and escapements. For several stocks, escapement or terminal run forecasts provided by agencies represent consistent relationships between siblings of the same brood, implying relatively stable natural survivals after fish reach age 2. For other stocks, forecasts consist of recent year averages or mechanistic models. Previous explorations have shown that forecasting error (*[Forecast-Observed]/Observed*) in large stocks can substantially influence aggregate abundance indices, whereas individual stock forecasting errors explain only low proportions of the variability in preseason AI errors. However, the composite error (Equation 3.1) of stocks with the largest contributions to AABM fishery-specific AIs is highly correlated with the corresponding AI error (Figure 3.20), explaining 70% of the variation in the AI error for SEAK, 60% for NBC, and 55% for WCVI. Including all forecasts—generated by the model or provided by agencies used for calibration purposes–does not increase the proportion of the variability in AI errors explained by the composite forecast error for driver stocks; the coefficient of determination actually decreases in NBC and WCVI.

$$Forecast\ Error = \frac{\left(\sum_{stock=1}^{n} Forecast - \sum_{stock=1}^{n} Observed\right)}{\sum_{stock=1}^{n} Observed} \qquad \textit{Equation 3.1}$$

In spite of the strong correlation between composite forecast error and AI error, the large overprediction observed for SEAK in 2012 was greater than expected given the corresponding composite forecast error. The 2012 AI error is the largest relative AI error for SEAK and the largest absolute error across AABM fisheries since 1999. The 2012 AI error for NBC was also among the largest positive errors ever observed whereas the AI error for WCVI was close to the average for positive errors.

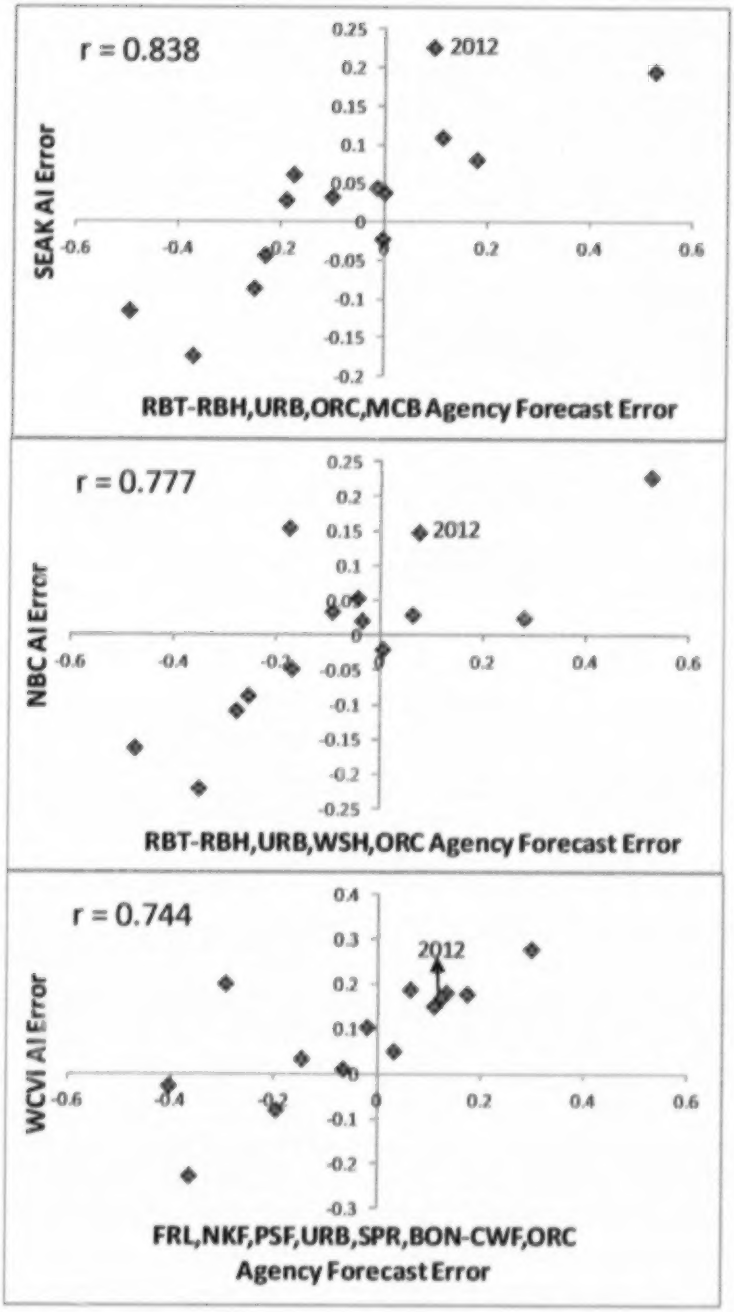

Figure 3.20 Relationship between composite agency forecast error and abundance index error for AABM fisheries SEAK, NBC, and WCVI.

Note: Composite forecast errors (Equation 3.1) are based on pooled abundances of stocks contributing on average more than 5% to AABM-specific abundance indices.

Although model stocks contribute at varying levels to the three AABM fisheries, it is informative to identify stock level variation in forecast performance within the context of the AI shifts noted for 2012. For the 2012 return, positive error (i.e., forecasts in excess of actual returns, forecast/actual >1.0) was evident for 17 stocks (Figure 3.21), half of which were moderate (50–100K) to large (>100K) stocks. Actual returns for the 10 remaining model stocks were at or above forecast levels, although most (7/10) of these stocks were relatively small in size (<10K). Noteworthy positive error was evident for a subset of Columbia River (Bonneville/Cowlitz Fall Hatchery, Mid-Columbia Brights, Summers) and all Fraser River (Earlies, Lates) stocks, as well as for the Southeast Alaska (AKS) stock. The extent of forecast error documented for these stocks in 2012 was among the most extreme since 1999, and the recent track record these and other stocks suggests there are regionally and temporally correlated patterns of positive error (Figure 3.19). Although underforecasting occurred for three large stocks in 2012 (Oregon Coast, Puget Sound Hatchery Fingerling, and WCVI Hatchery+Natural [RBH]), the extent and pattern of error was notable for only one of them (RBH). In particular, the WCVI Hatchery/Natural return was approximately 50% higher than forecast and has erred in this way in nearly all years since 1999 (Figure 3.19). These results in combination with the forecast issues associated with the 2013 preseason calibration (i.e., RBH forecast issues [Appendix K], preliminary indication of underforecasting of record URB/MCB return) suggest that preseason applications of the PSC Chinook model will benefit from efforts aimed at reducing forecast error, especially for driver stocks.

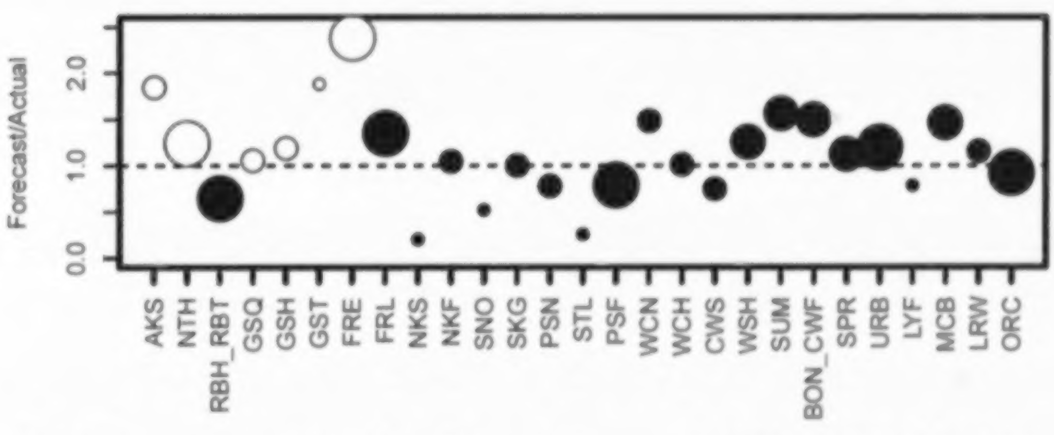

Figure 3.21 Forecast error (forecast/actual) for stocks represented in the Chinook Model for 2012.

Note: Points lying above the dashed horizontal line returned lower than forecast; points lying below the dashed horizontal line returned greater than forecast. Black symbols correspond to stocks with agency-supplied forecasts; white symbols correspond to stocks with forecasts generated by the Chinook Model. The four symbol sizes correspond to categories of increasing relative stock size (based on average terminal run size; <10K, 10–50K, 50–100K, and >100K). Stocks are arranged along the x-axis from north to south, and are defined according to the codes in Table 3.10.

3.2.4.3.1 Potential for preseason AI correction

For stocks without agency forecasts, preseason forecasts are generated automatically by the CTC Model, assuming average survival and maturation rates for the broods contributing to the coming fishing season. In January 2013, the CTC made progress on this regard finding a combination of EVs and maturation-rate averages that minimized AI errors when evaluated retrospectively. These assumptions were applied to the 2013 model calibration to generate the corresponding preseason AIs. It has been shown that agency forecast error is a moderate contributor to preseason AI error and that reducing preseason AI bias through changes in assumptions regarding survival and maturation rates slightly reduces the AI error but do not eliminate it. Hence, it remains a challenge to develop methods that predict the direction and magnitude of error in preseason AIs, which could greatly improve the coastwide management of Chinook stocks. Other analyses conducted by CTC members have demonstrated how indices of coastwide stock performance can predict and reduce model errors in preseason AIs. In particular, a Production Index based on prefishing abundances has proved to be a powerful predictor of relative AI error ([*Preseason-Postseason*]/*Postseason*) across AABM fisheries. These analyses have identified a clear tendency to overpredict AIs when production is low and to underpredict it when production is high. This pattern is consistent across AABM fisheries, thus allowing the development of regression models that can help predict the direction and magnitude of preseason AI errors. The use of Production Index models successfully predicted the direction of errors for all three AABM fisheries for 2012 (Figure 3.22), and if used to adjust first postseason AIs, it would have reduced the error completely for NBC, by 60% for WCVI, and by 23% for SEAK. The ability to predict and reduce AI error is particularly important in the face of the undesirable combination of low abundance and overforecasting evidenced in these analyses. It is important to find appropriate ways to include information generated by these studies in the annual CTC assessments and abundance forecasts.

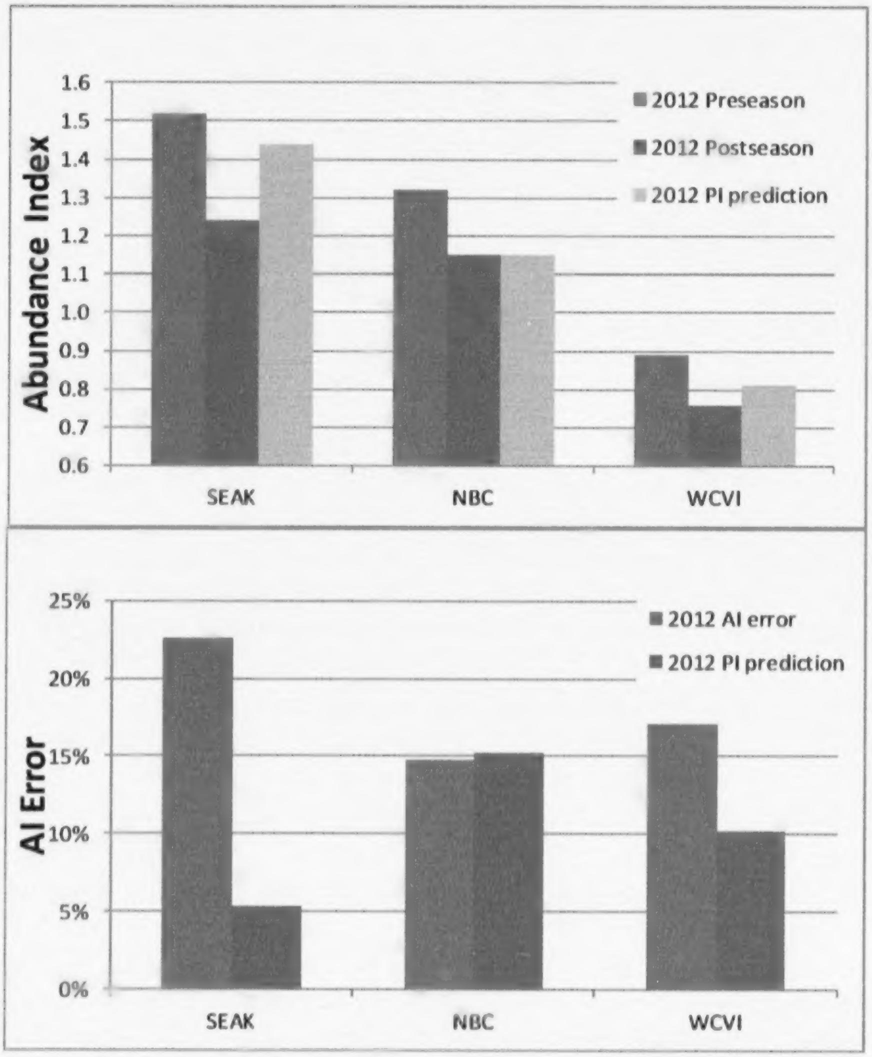

Figure 3.22 Comparing AI errors and AIs generated by the Chinook Model (CLB 1309) with those generated by the Production Index (PI) Model for AABM fisheries in 2012.

3.2.4.4 *Model Improvement Activities*

Improvements to the PSC Chinook model are one of the high priorities identified in the 2009 Agreement that included substantial, dedicated resources ($1 million U.S.). Information and data generated by the Chinook model are used for many purposes, including the management of AABM and ISBM fisheries and the estimation of fishing impacts for model stocks. Knowledge about the model's performance can help direct model improvement resources to where they are needed and beneficial. During 2013, the CTC engaged in the following model improvement activities, which are still ongoing:

1. Data Generation Model: The CTC's stock and fishery assessment methods are largely derived from CWT data. With data collected from the field, it is not feasible to determine the accuracy of statistical estimates derived from the application of methods and algorithms employed by the CTC. A Data Generation Model (DGM) is being developed to evaluate the performance of CWT methods in situations where CWT recoveries and incidental mortalities are known with certainty. The DGM will generate the necessary information to allow for experiments and thorough and systematic evaluations of metrics of interest, including alternative ISBM metrics that were identified for further evaluation in CTC (2011).

2. Revisions to the CTC PSC Chinook Model: Revisions of the Model are being made to incorporate features that have been determined to be feasible and important. For example, modifying the manner in which incidental mortalities are allocated by stock and age, the ability to incorporate observations of encounters of fish that are not retained as landed catch, modifying the stocks and fisheries contained in the Model, and directly incorporating forecasts of ocean abundance instead of relying upon Model calibration algorithms.

3. Chinook Interface System: The CTC is developing an integrated system and platform consisting of a database and associated computer programs to improve the efficiency of the CWT exploitation rate and Model calibration processes.

4. SharePoint: The CTC is supporting the development of SharePoint capabilities to improve the efficiency of CTC analyses and report generation. This SharePoint site will allow the CTC to store information, reports, and analyses. It will also allow for collaboration and the transfer of information that will aid in the preparation and dissemination of the annual CTC reports and assignments.

5. Comparison of CWT and Model-based estimates of stock and fishery impacts: The CTC is undertaking a comparison of statistics derived from CWT recovery data and data generated by the Model, including estimates of stock age and BYER, and maturation rates.

Technical Notes are being developed to memorialize the findings and developments of these investigations and model improvement initiatives.

4 Evaluation of Mark-Selective Fisheries

Chinook salmon released from Puget Sound hatcheries and spring-run hatchery Chinook salmon in the Columbia River have been mass marked since BY 1998. Mass marking of Columbia River fall Chinook salmon started with BY 2005, and for BY 2009 onwards most of the Chinook salmon production intended for harvest released in Washington and Oregon has been mass marked (SFEC 2009). Mark-selective fisheries (MSFs) have been in place in Puget Sound (including U.S. Strait of Juan de Fuca) since 2003, on the Columbia River since 2001, in some terminal fishing areas along the Oregon and Washington coast since 2008, and in B.C. Juan de Fuca since 2008 (Table 4.1). Additionally, the first ocean mark-selective Chinook fishery occurred off the Washington Coast (Areas 1–4) in 2010. No new MSFs were introduced during fishing year 2011.

4.1 Catch in MSFs

A mixed-bag, partial MSF has occurred in the B.C. Juan de Fuca sport fishery since 2008 (Table 4.1). The fishery has a minimum size limit of 45 cm, with a daily bag limit of two Chinook salmon; however, wild Chinook salmon exceeding a fork length of 67 cm must be released. The mixed-bag, partial MSF regulation is intended to protect Fraser River Spring-run age-1.2 and age-1.3 stock groups as they returned to the Fraser River.

MSFs have been in place in Puget Sound in Washington Areas 5 and 6, part of Puget Sound North Sport (PSN Sp) during the summer since 2003. In 2005 a winter MSF started in Washington Areas 8-1 and 8-2 (Puget Sound other sport, PSO S). In 2007 additional MSFs were implemented in Washington Areas 9, 10, and 11 (PSO S) in the summer months and in Areas 7 (PSN S), 9, and 10 (PSO S) in the winter months (Table 4.1; Table 4.2). MSFs have continued to expand in Puget Sound marine areas to the extent that in 2010 all marine sport management areas have MSFs for at least some portion of the year. Total landed catch in MSFs in marine sport fisheries remained fairly constant from 2003 to 2005, around 3,000 to 4,000, then increased to approximately 25,000 beginning in 2007. Landed catch in nonselective fisheries has declined from approximately 25,000 to 6,000 over the same period (Figure 4.1). Since 2007, catch in MSF fisheries in northern Puget Sound marine areas has nearly doubled, while MSF catches in other marine areas have remained about the same. MSFs have been implemented in freshwater areas (TERM S) since 2003 (Figure 4.2; Table 4.3), with total estimated MSF catch ranging from 1,000 to 7,000. The percent of total MSF catch in the three PSC sport fisheries in Puget Sound (Figure 4.1) for 2011 is approximately 65% in PSN, 90% in PSO, and approximately 60% in freshwater (TERM S).

Chinook salmon MSFs have been in place in the Columbia and Willamette rivers since 2001 (Table 4.1). Most of the catch from MSFs has been directed on mass marked spring Chinook salmon from the Willamette, Cowlitz, Kalama, Lewis rivers in the lower Columbia, tributaries in the upper Columbia upstream of Bonneville Dam, and in the Snake River (Table 4.1). The first MSF in the mainstem Columbia on summer run Chinook salmon occurred in 2003, and has occurred annually since 2010. MSFs on fall Chinook salmon were first implemented in the Lower Columbia tributaries in 2008 (Grays River only) and have expanded to the other streams with significant numbers of hatchery origin fish (e.g., Elochoman, Cowlitz, Toutle, Lewis, Kalama, Washougal, Wind, and White Salmon rivers, and Drano Lake). Total catch in these MSF

fisheries is smaller than the catches from the mainstem Columbia River that has not been under MSF regulations during the fall season (Table 4.1).

Beyond the Columbia River, relatively short Chinook MSF seasons have occurred in both Oregon and Washington coastal waters during recent years (Table 4.1). The May–June MSF catch of Chinook salmon in the Washington-Oregon ocean sport fishery (WDFW Marine Areas 1–4) was approximately 2,400 in 2010 and 5,000 in 2011. There has also been a spring Chinook-directed sport MSF in the Oregon north coast terminal areas since 2008; catch estimates for this fishery are not available at this time.

Table 4.1 Mark-selective fisheries occurring 2003–2011 (√).

Fishery	Location	Period	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sport	B.C. Strait of Juan de Fuca, selected subareas	Mar–Apr						√	√	√	√
Sport	WA/OR Ocean Area 1-4	June								√	√
Sport	WA PS Area 5	Summer	√	√	√	√	√	√	√	√	√
Sport	WA PS Area 6	Summer	√	√	√	√	√	√	√	√	√
Sport	WA PS Area 7	Winter						√	√	√	√
Sport	WA PS Area 8.1	Winter			√	√	√	√	√	√	√
Sport	WA PS Area 8.2	Winter			√	√	√	√	√	√	√
Sport	WA PS Area 9	Summer					√	√	√	√	√
Sport	WA PS Area 9	Winter						√	√	√	√
Sport	WA PS Area 10	Summer					√	√	√	√	√
Sport	WA PS Area 10	Winter						√	√	√	√
Sport	WA PS Area 11	Summer					√	√	√	√	√
Sport	WA PS Area 11	Winter							√	√	√
Sport	WA PS Area 12	Winter								√	√
Sport	WA PS Area 13	Summer					√	√	√	√	√
Sport	Nooksack	Sep–Dec		√	√	√	√	√	√	√	√
Sport	Skykomish	Jun–July	√	√	√	√	√	√	√	√	√
Sport	Carbon and Puyallup	Aug–Dec	√	√	√	√	√	√	√	√	√
Sport	Upper Skagit	Jun–July			√	√	√	√	√	√	√
Sport	Nisqually	Jul–Jan				√	√	√	√	√	√
Sport	Skokomish	Aug–Dec								√	√
Sport	Quillayute	Feb–Dec	√	√	√	√	√	√	√	√	√
Sport	Hoh	May–Aug						√	√	√	√
Sport	Willapa Bay and tributaries	Jul–Jan								√	√
Commercial	Willapa Bay	Aug–Nov								√	√
Sport	Columbia	Summer	√	√		√		√		√	√
Sport	Lower Columbia	Spring	√	√	√	√	√	√	√	√	√
Sport	Lower Columbia tributaries	Fall									√
Commercial (tangle net)	Lower Columbia	Spring	√	√	√	√	√	√	√	√	√
Commercial, (large net)	Lower Columbia	Spring	√	√	√	√	√	√	√	√	√
Sport	Willamette	Spring	√	√	√	√	√	√	√	√	√
Sport	Yakima	Spring		√				√		√	√
Sport	Lower Snake	Fall						√	√	√	√
Sport	Lower Snake	Spring								√	√
Sport	Oregon terminal	Spring						√	√	√	√

Note: See SFEC (2013) for more detailed information on MSF proposals and fisheries.

Table 4.2 ***Retained or landed catch and total encounters (landed + released) and total mortalities (landed + release mortalities) by size and mark category in MSFs for Puget Sound and Juan de Fuca marine sport fisheries (PSN, PSO, JDF) for 2003–2011 and the Washington-Oregon ocean sport fishery in 2011.***

Fishery	Stat Area	Year	MSF period	Retained Marked Fish	Retained Unmarked fish	Encounters Marked	Encounters Unmarked	% Marked	Legal-sized Marked fish Landed & Release Mortalities	Legal-sized Unmarked fish Landed & Release Mortalities	Sub-Legal-sized Marked fish Landed & Release Mortalities	Sub-Legal-sized Unmarked fish Landed & Release Mortalities
B.C. Juan de Fuca (JDF)	Area 19,20	2008	Apr–May	122	51	122[1]	68[1]	64%	122[2]	64[2]	5[2]	3[2]
	Area 19,20	2009	Mar–May	152	26	152[1]	105[1]	59%	152[2]	41[2]	24[2]	16[2]
	Area 19,20	2010	Mar–May	827	347	827[1]	704[1]	54%	827[2]	135	NA	NA
	Area 19,20	2011	Mar–May	1319	793	1,319[1]	1,231[1]	52%	1,319[2]	236	NA	NA
WA/OR Ocean	Area 1-4	2010	Jun	5,018	19	7,565	3,791	67%	5,123	384	252	164
	Area 1-4	2011	Jun	2,301	35	5,404	2,743	34%	2,439	209	386	205
Puget Sound North (PSN)[3]	Area 5	2003	Jul–Aug	2,476	53	4,469	8,663	34%	2,301	569	556	1,035
	Area 5	2004	Jul–Aug	2,900	0	4,471	6,479	41%	2,766	603	427	492
	Area 5	2005	Jul–Aug	1,620	49	3,058	2,927	51%	1,554	236	342	318
	Area 5	2006	Jul–Aug	3,301	17	4,775	5,354	47%	3,175	479	398	449
	Area 5	2007	Jul–Aug	3,250	117	5,065	3,744	58%	3,036	400	554	317
	Area 5	2008	Jul–Aug	2,819	0	3,298	2,199	60%	2,836	280	58	66
	Area 5	2009	Jul–Aug	5,958	439	16,504	20,958	44%	4,952	1,009	3,079	3,223
	Area 5	2010	Jul–Aug	5,703	14	9,682	9,114	52%	5,583	758	875	828
	Area 5	2011	Jul–Aug	4,535	92	6,764	14,686	32%	4,354	1,461	594	1,085
	Area 6	2003	Jul–Aug	941	22	1,133	1,408	45%	962	215	10	21
	Area 6	2004	Jul–Aug	671	5	813	835	49%	684	128	11	2
	Area 6	2005	Jul–Aug	404	4	534	790	40%	413	118	14	3
	Area 6	2006	Jul–Aug	340	9	388	494	44%	345	74	2	7
	Area 6	2007	Jul–Aug	722	7	838	411	67%	731	68	9	0
	Area 6	2008	Jul–Aug	537				61%				
	Area 6	2009	Jul–Aug	2,293	--	--	--	66%	--	--	--	--
	Area 6	2010	Jul–Aug	1,383	--	--	--	52%	--	--	--	--
	Area 6	2011	Jul–Aug	3,283				66%				
	Area 7	2007–2008	Feb	1,325	2	1,768	1,199	60%	1,331	158	72	31
	Area 7	2008–2009	Feb–Apr	1,420	9	1,768	733	71%	1,437	115	42	3
	Area 7	2009–2010	Dec–Apr	1,418	0	2,341	585	80%	1,431	66	161	29
	Area 7	2010–2011	Dec–Apr	2,378	4	3,253	2,523	56%	2,421	302	114	106
	Area 8-1, 2	2006–2007	Oct–Apr	1,176	33	13,254	6,598	67%	1,067	72	2,517	1,260
	Area 8-1, 2	2007–2008	Nov–Apr	1,543	23	4,040	1,388	74%	1,465	92	568	179
	Area 8-1,2	2009	Jan–Apr	911	27	4,044	1,468	73%	910	24	621	287
	Area 8-1,2	2009–2010	Nov–Apr	1,109	4	3,166	969	77%	1,112	36	400	151
	Area 8-1,2	2010–2011	Nov–Apr	211	0	454	192	70%	202	5	57	31
	Area 9	2007	Jul	5,239	33	7,236	1,461	83%	5,200	180	403	83
	Area 9	2008	Jul–Aug	4,045	3	7,854	5,436	59%	4,124	244	653	765
	Area 9	2009	Jul–Aug	3,229	20	11,946	4,196	74%	3,159	210	1,790	581
	Area 9	2010	Jul–Aug	5,292	39	6,782	2,413	74%	5,393	352	159	55
	Area 9	2011	Jul–Aug	2,363	25	4,852	2,238	68%	2,336	190	508	220
	Area 9	2007–2008	Jan–Apr	1,405	3	2,889	682	81%	1,362	49	330	75
	Area 9	2008–2009	Nov, Jan–Apr	885	14	4,537	3,009	60%	891	37	718	567
	Area 9	2009–2010	Nov–Apr	1,557	27	4,230	1,097	79%	1,483	76	598	146
	Area 9	2010–2011	Nov–Apr	432	0	1,078	539	67%	438	18	120	84
	Area 10	2007	Jul	1,539	38	4,849	1,258	79%	1,501	105	690	152

-continued-

Table 4.2 Page 2 of 2.

Fishery	Stat Area	Year	MSF period	Retained Marked Fish	Retained Unmarked fish	Encounters Marked	Encounters Unmarked	% Marked	Legal-sized Marked fish Landed & Release Mortalities	Legal-sized Unmarked fish Landed & Release Mortalities	Sub-Legal-sized Marked fish Landed & Release Mortalities	Sub-Legal-sized Unmarked fish Landed & Release Mortalities
Puget Sound Other	Area 10	2008	Jul–Aug	1,031	3	1,348	898	60%	1,046	79	42	77
	Area 10	2009	Jul–Aug	1,621	22	4,329	1,121	79%	1,538	34	613	203
	Area 10	2010	Jul–Aug	2,988	42	4,444	2,734	62%	3,015	187	242	342
	Area 10	2011	Jul–Aug	2,643	29	3,979	2,595	61%	2,604	295	287	153
	Area 10	2007–2008	Dec–Jan	635	21	2,575	545	83%	551	45	468	72
	Area 10	2008–2009	Dec–Jan	251	0	1,302	498	72%	253	5	207	92
	Area 10	2009–2010	Oct–Jan	395	3	2,979	984	75%	362	15	548	180
	Area 10	2010–2011	Oct–Jan	162	0	998	793	56%	153	8	176	148
	Area 11	2007	Jun–Sep	10,546	95	20,090	5,468	79%	10,419	527	1,960	493
	Area 11	2008	Jun–Sep	7,377	23	10,434	2,270	82%	7,440	318	494	54
	Area 11	2009	Jun–Sep	3,277	37	7,582	4,623	62%	3,230	211	884	680
	Area 11	2010	Jun–Sep	3,910	64	5,390	1,575	77%	3,970	230	207	81
	Area 11	2011	Jun–Sep	2,637	20	4,951	3,719	57%	2,617	327	464	327
	Area 11	2009–2010	Feb–Apr	326	3	487	93	84%	322	15	33	2
	Area 11	2010–2011	Feb–Apr	87	3	421	331	56%	80	16	73	48
	Area 12	2010	Feb–Apr	300	–	–	–	50%	–	–	–	–
	Area 12	2011	Feb–Apr	435	–	–	–	65%	–	–	–	–
	Area 13	2009	May–Sep	1,340	–	–	–	86%	–	–	–	–
	Area 13	2010	May–Sep	668	–	–	–	82%	–	–	–	–
	Area 13	2011	May–Sep	1,001	–	–	–	57%	–	–	–	–

[1] Legal-sized Chinook salmon.

[2] IM and drop-off rates same as used in CTC Catch and Escapement report: drop-off (6.9) and IM release rate (12.3).

[3] Estimates for Puget Sound North and Puget Sound Other fisheries were updated with creel values from the Washington State-Tribal Recreational Angling Impacts Database (Accessed September 2013; url not publicly available), with the exception of Area 6 in 2008–2010 and Areas 12 and 13 in all years (these are based on draft WDFW Catch Record Card system estimates). IM rates used for Puget Sound MSFs are those used by WDFW in MSF impact assessments (legal = 10% release + 5% drop off; sublegal = 20%).

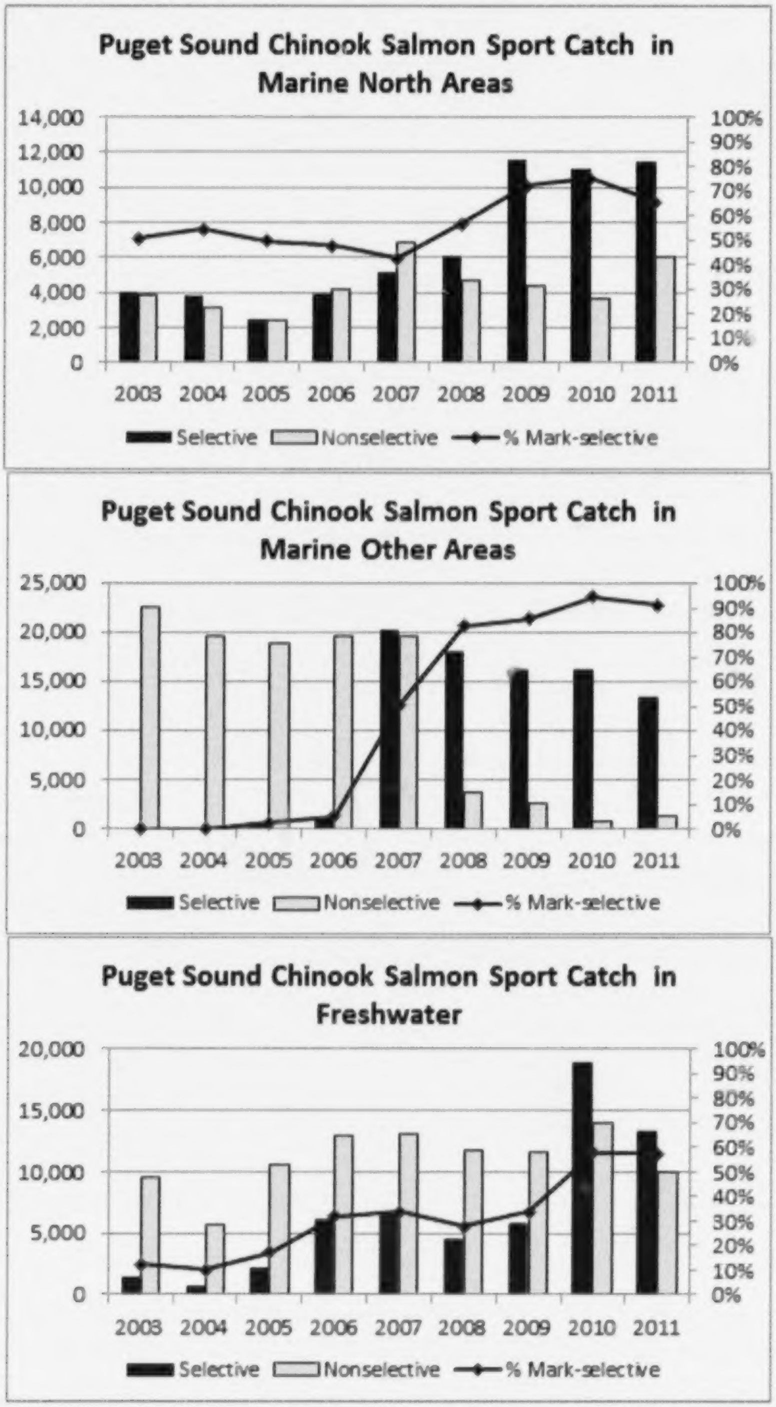

Figure 4.1. Estimated total number of Chinook salmon landed in selective and nonselective fisheries (left y-axis) and % of catch in MSFs (right y-axis) in Puget Sound for catch years 2003–2011.

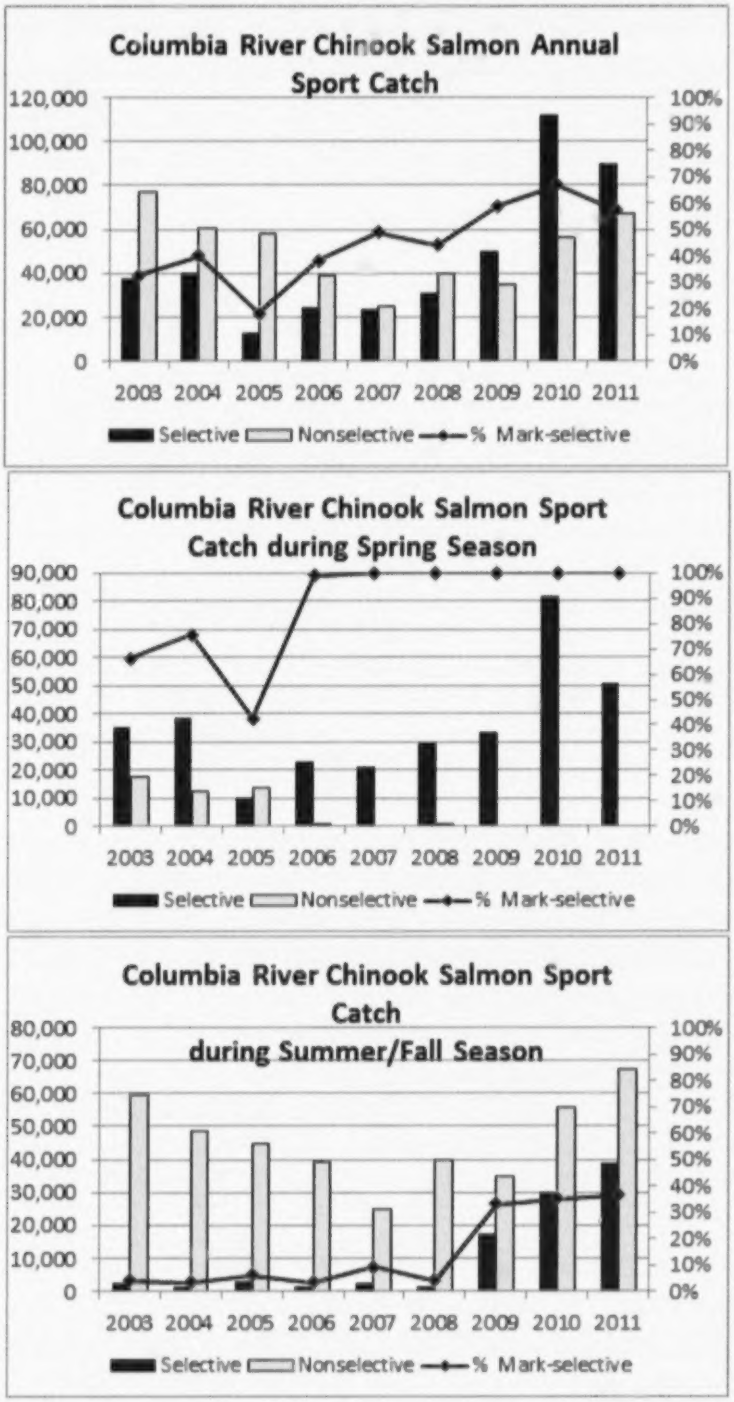

Figure 4.2. Estimated total catch (left y-axis) in Columbia River mark-selective and nonselective sport fisheries and catches during spring (May–June) and summer–fall seasons (Jul–Dec) and % of catch in MSFs (right y-axis) for catch years 2003–2011.

Table 4.3 Total catch (adult salmon) in Puget Sound TERM Sport MSFs for Chinook salmon 2003–2011.

Location	2003	2004	2005	2006	2007	2008	2009	2010	2011
Nooksack River	–	5	168	119	156	14	30	50	72
Skykomish River	127	85	114	145	551	388	131	243[1]	382[1]
Carbon River & Puyallup River	1,292	869	1,879	1,420	2,085	1,534	2,581	466	2,142
Upper Skagit River and Cascade River	–	–	121	590	805	271	96	240[1]	219[1]
Nisqually River	–	–	–	2,209	3,056	1,567	1,174	2,654[1]	2,200[1]
Skokomish River	–	–	–	–	–	–	–	5,631[1]	5,268[1]

Source: Estimates are from the WDFW Catch Record Card system unless noted otherwise.
[1] Estimates are from the WDFW intensive creel study.

4.2 Size of MSFs

The size of a MSF relative to the total exploitation of a stock can be measured using the percentage of the total landed catch in net, sport and troll fisheries of tagged and marked PSC indicator stocks that occurs in MSFs (Table 4.4). MSFs were first implemented in Puget Sound and on spring stocks in the Columbia River. In Puget Sound a MSF occurred in the summer of 2003 in the Strait of Juan de Fuca and by 2011 had expanded to all areas in Puget Sound (Table 4.2). In 2008, MSFs were implemented in the Columbia River on fall Chinook salmon, in B.C. in the Strait of Juan de Fuca, and in terminal areas of the Oregon coast. The percentage of the total landed, tagged, and marked catch that occurs in MSFs increased over this period for stocks in Puget Sound (Figure 4.3); in 2011 the average was 25.2% and ranged from 3.2–55.1% (Table 4.4).

4.3 Impact of MSFs on unmarked Chinook salmon

PSC indicator stocks that have been double index tagged (DIT) can be used to evaluate the impact of MSFs on the unmarked stocks represented by the unmarked tag group in a DIT pair.[3] The ratio of unmarked to marked fish (λ) for a DIT group provides a relationship between the two tag groups and a measure to evaluate the impact of MSFs on the DIT stock. A comparison of the ratios of unmarked to marked, at release and at escapement, can be used in a test of the null hypothesis of no difference in proportional return of marked and unmarked groups. A positive test statistic occurs when a higher proportion of unmarked fish return to hatchery escapement; this is consistent with the larger harvest of marked fish compared to unmarked fish through MSFs. A negative test statistic occurs when a higher proportion of marked fish return, which could be indicative of sampling problems in the hatchery (i.e., the sampling procedure fails to detect all CWTs from unmarked fish present in the sample), or incorrect assumptions about release mortality rates, multiple encounters, or mark recognition errors.

[3] A DIT group consists of at least two tag groups, one with the mass mark (or adipose fin clip) and one without the mark. These two tag groups are treated identically except for the mark and differences in mortality should be due to the MSFs, assuming there is no mark mortality occurring prior to recruitment to the fisheries.

This is a concern when patterns occur over many BYs for a stock or hatchery. If stock-specific MSF impacts are small, then random variation in the CWT sampling procedures or simply random variability in processes, like survival, could result in both positive and negative test statistics in a random pattern across broods.

The ratio of the return proportions between the unmarked and marked tagged groups, or the odds ratio, $\frac{\lambda^{unmarked}}{\lambda^{marked}}$ (Agresti 1984), are methods to statistically compare the DIT groups, where an odds ratio of one indicates that the ratio did not change from release to escapement while an odds ratio larger than one indicates a higher removal of marked fish compared to the DIT unmarked fish, which is assumed to be due to MSFs.

Table 4.4 *Estimated landed catch of tagged and marked PSC Chinook Indicator Stocks in B.C., Washington, and Oregon, in all net, troll, and sport fisheries for catch years 2003–2011 and % of total tagged and marked catch landed in MSFs.*

REGION	STKNAME	2003		2004		2005		2006		2007		2008		2009		2010		2011	
BRITISH COLUMBIA	Atnarko Spring															1		43	
	Atnarko Summer	149		160		312		299		91		2		329		238		322	
	Big Qualicum	89		114		219		145		214		146	10%	162	2%	155		129	
	Chilliwack (Harrison Fall Stock)	1,258	2%	1,426	1%	1,203	1%	594	1%	379	2%	1,036	4%	699	5%	1,459	6%	994	9%
	Cowichan Fall	218	1%	276	1%	184	2%	174		49		140		280		484	3%	764	7%
	Dome Creek Spring	126		1		161		14		6									
	Nanaimo River Fall	260	3%	254		141	3%	49		441	1%	44		6					
	Nicola River Spring	240		139		101		69		43		68		88	4%	197	4%	97	
	Puntledge Summer	21		26		78		44		57		51		116		123		99	
	Quinsam Fall	202		317		364		282		265		100		141		201		304	
	Robertson Creek	1,161		2,527		2,301		1,749		1,637		831		813		333		1,334	
	Lower Shuswap River Summers	637		607		459		721		127		570		725	0%	858		742	1%
	Chehalis (Harrison Fall Stock)	140	3%	295	3%	262		227		77	2%	509	2%	279	11%	452	7%	586	6%
	Kitsumkalum Summer	182		246		109		108		144		242		168		238		186	
PUGET SOUND	George Adams Fall Fingerling	546	2%	628	6%	910	5%	551	4%	888	10%	468	15%	547	26%	960	18%	1,029	33%
	Green River Fall Fingerling	456	6%	467	3%	305	3%	661	3%	895	6%	721	14%	646	11%	290	19%	473	19%
	Grovers Creek Fall Fingerling	779	7%	747	5%	732	3%	878	6%	814	17%	373	35%	573	24%	591	32%	372	28%
	Nisqually Fall Fingerling	1,149	3%	921	1%	446	2%	1,830	2%	1,891	11%	735	13%	880	14%	1,051	22%	592	26%
	Nooksack Spring Fingerling	215		454		367	2%	326	2%	288	2%	622	6%	311	8%	410	5%	207	5%
	Samish Fall Fingerling	522	0%	354	1%	525	4%	1,307	2%	1,405	3%	1,240	10%	878	11%	1,177	9%	818	4%
	Skagit Spring Fingerling	220	1%	349	1%	401	11%	728	48%	1,221	41%	698	32%	455	33%	705	33%	594	33%
	Skagit Spring Yearling	429	2%	445	2%	470	19%	459	57%	455	54%	352	45%	214	34%	261	55%	337	50%
	Skykomish Fall Fingerling	83	6%	235	6%	202	2%	272	9%	429	4%	143	22%	88	40%	72	27%	189	55%
	South Puget Sound Fall Yearling	5		21		226	7%	208	5%	222	23%	63	42%	114	60%	56	63%	207	51%
	Skagit Summer Fingerling	312	1%	185	2%	311	2%	292	3%	396	1%	453	3%	505	4%	215	1%	285	10%
	Stillaguamish Fall Fingerling	6				120	5%	158	3%	325	0%	376	20%	290	13%	356	13%	426	12%
	White River Spring Fingerling							30	4%	329	23%	52	13%						

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Table 4.4 Page 2 of 2.

REGION	STKNAME	2003		2004		2005		2006		2007		2008		2009		2010		2011	
WASINGTON COAST	Hoko Fall Fingerling	219		280	2%	239	2%	201	2%	270	2%	127		85	5%	77		210	4%
	Queets Fall Fingerling	935		1,257		1,318		692		488		511		914		1,134		899	
	Sooes Fall Fingerling	356	1%	362	1%	344		161	2%	37		51		159		94	6%	279	2%
COLUMBIA RIVER	Lyons Ferry Yearling	2,834	1%	3,595	2%	3,330	1%	1,723	1%	1,955	2%	1,348	1%	3,203	8%	4,067	3%	3,031	8%
	Cowlitz Fall Tule	301		117	4%	96		54		51		63	5%	129	6%	213	3%	126	2%
	Hanford Wild	643		868		359		325		191		141		201		235		316	
	Columbia Lower River Hatchery	1,063	1%	920	0%	348		45		40		228		335	8%	1,059	4%	445	4%
	Lewis River Wild	204		353		190		352		112		41		81		51		156	5%
	Lyons Ferry	183		78		137	5%	106		101		636	0%	595	1%	1,563	8%	1,133	5%
	Spring Creek Tule	3,259	0%	3,078	0%	1,408		472	1%	572	2%	1,454	2%	1,268	5%	2,604	2%	1,542	3%
	Columbia Summers	4,241	0%	3,882	0%	4,217		2,548	0%	2,672	1%	2,539	0%	2,110	6%	3,333	4%	2,382	20%
	Upriver Brights	1,054		995	0%	1,493		931	0%	334		419		738	1%	662		1,617	2%
	Willamette Spring	1,325	30%	2,051	44%	761	29%	694	42%	423	52%	849	33%	1,403	52%	4,130	62%	3,866	82%
OREGON	Elk River	2,423		2,530		1,257		1,384		1,320		1,425		991	0%	1,225	0%	959	0%
	Salmon River	2,746		2,906		3,144		1,439		516		766		1,407	2%	2,448		2,743	

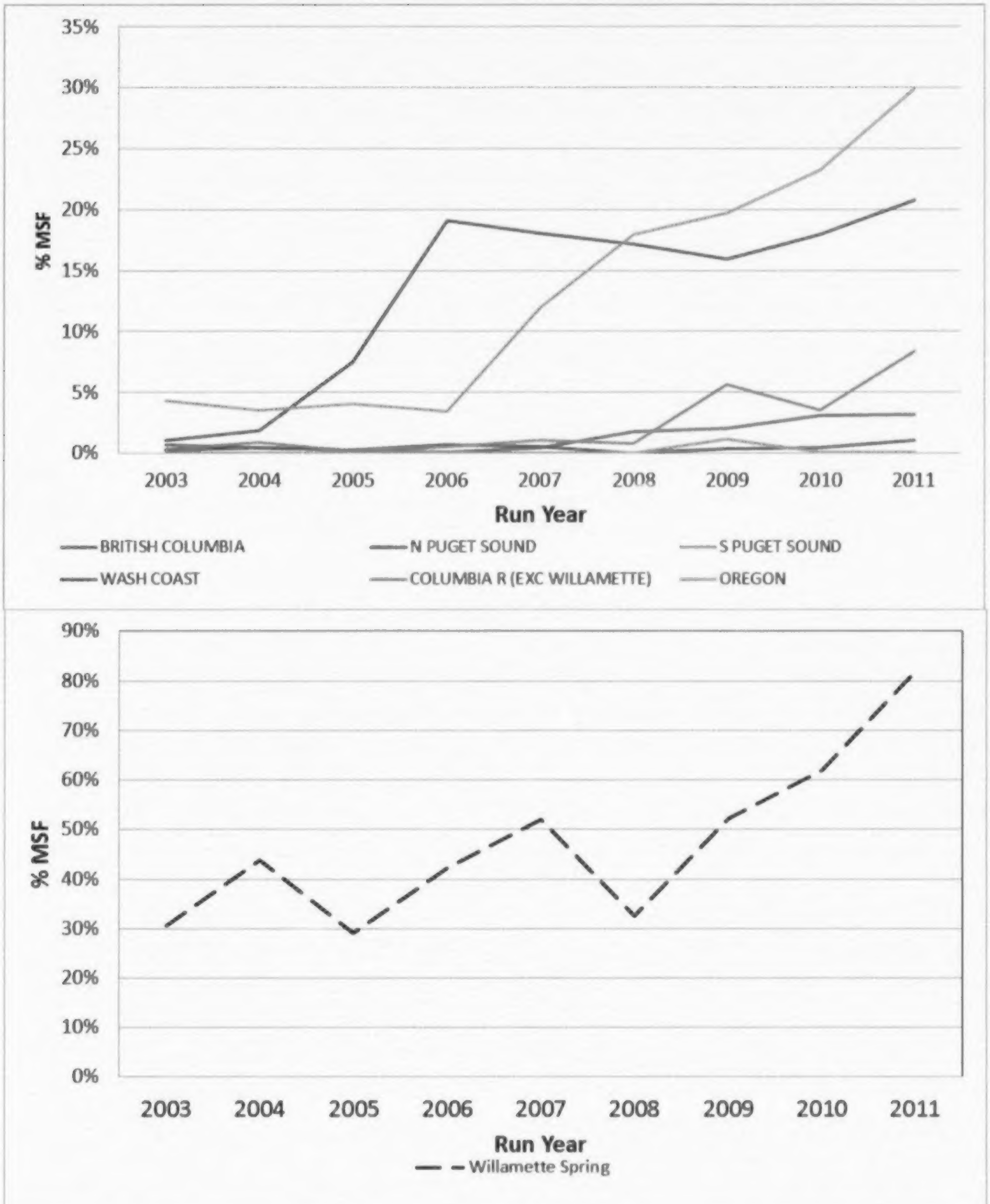

Figure 4.3. Percent of total fishery CWT recoveries in MSFs for run years 2003–2011 for Chinook salmon indicator stocks, by region of origin.

Among the DIT stocks examined in Table 4.5, MSF impacts have been statistically identified more often for recent BYs, except for BY 2009, from which only age-2 fish had matured at the

time of analysis (Figure 4.4). There is double index tagging for several Puget Sound indicator stocks, where MSFs have been ongoing since 2003. The comparison of the proportion of marked and unmarked DIT groups returning were not significant for BYs before 2002 for Puget Sound stocks (Table 4.5). For Puget Sound DIT stocks, Skagit Springs (SKS), Skykomish (SKY), Green River (SPS) and Nisqually (NIS) show significant differences in four or more years. All these Puget Sound DIT stocks except the Green River are subject to terminal sport MSFs which target the hatchery production including the DIT returns. When releases and recoveries are summed over North and South Puget Sound DIT stocks the odds ratio is significantly larger than one for BYs 2001–2009 (Figure 4.5) which all have at least 2 ages returning in years with MSFs. The temporal pattern of the odds ratio for the Puget Sound stocks (Figure 4.5) shows that unmarked fish have returned at higher rates than marked fish over the recent time series, presumably due to MSF impacts.

Two Columbia River stocks have DIT: Big Creek for the Lower River Hatchery stock (LRH) and Spring Creek Tule (SPR). The Big Creek stock shows significantly higher return of unmarked fish for 2007 and 2009, but this stock had not been a DIT stock in earlier years. The MSF impacts (Table 4.4) have all occurred in Washington Area 5 and Washington coastal MSFs for this group. The results for the Spring Creek Tules show a negative significant impact indicating fewer unmarked fish returning to the hatchery in two years. This may be due to a problem with the assumptions of the DIT program (e.g., both marked and unmarked tagged groups are identical except for the mark, equal survival) or due to sampling problems in the hatchery.

In British Columbia, the Chilliwack River stock is only subject to preterminal MSFs in U.S. marine areas around Puget Sound and in U.S. and Canadian MSFs in Juan de Fuca Strait. There are no terminal MSFs targeting this stock in Canadian marine or freshwater areas. Four brood have significant results, but two of these had significantly higher returns of unmarked fish, possibly indicating either problems with sampling or assumptions.

Table 4.5 Results for hypothesis test (Ho: No difference in proportion of release of marked and unmarked DIT groups returning to hatchery) by stocks and BYs where DIT data are available.

Stock		Brood Year	Signature?	Unmarked			Marked								
				Ret	Rel	Prop. Ret	Ret	Rel	Prop. Ret	λ rel	λ esc	Odds Ratio	Oldest age in brood	Z-statistic for H(o) of no impact[1]	p(0.05)
COLUMBIA RIVER	LRH	2006		82	221,861	0.00037	92	222,476	0.00041	0.9972	0.8955	0.8979	5	–0.70	0.48
		2007	Y	414	226,752	0.00182	285	227,193	0.00125	0.9981	1.4517	1.4545	4	4.86	0.00
		2009	Y	362	225,203	0.00161	256	225,945	0.00113	0.9967	1.4163	1.4210	2	4.28	0.00
	SPR	2004		95	429,068	0.00022	88	447,881	0.00020	0.9580	1.0849	1.1324	5	0.82	0.41
		2005		1,130	446,416	0.00253	1,210	442,908	0.00273	1.0079	0.9344	0.9270	5	–1.15	0.25
		2006		288	446,241	0.00064	314	446,377	0.00070	0.9997	0.9165	0.9167	5	–0.62	0.53
		2007	Y	755	445,588	0.00552	1,604	445,962	0.01211	2.9970	1.3963	1.3973	4	–4.47	0.00
		2008	Y	495	439,989	0.00227	585	359,893	0.00325	2.4452	1.7073	1.4579	3	–2.30	0.02
BRITISH COLUMBIA	CHI	1998	Y	145	98,926	0.00150	301	98,095	0.00310	1.0080	0.4810	0.4772	5	–7.44	0.00
		1999	Y	403	96,193	0.00420	347	97,903	0.00350	0.9830	1.1610	1.1811	5	2.29	0.02
		2000		170	100,056	0.00170	168	99,766	0.00170	1.0030	1.0110	1.0080	5	0.08	0.94
		2001		230	97,227	0.00240	260	99,171	0.00260	0.9800	0.8850	0.9031	5	–1.13	0.26
		2002	Y	182	99,657	0.00180	232	100,036	0.00230	0.9960	0.7830	0.7861	5	–2.45	0.01
		2003		215	48,344	0.00440	239	48,242	0.00490	1.0020	0.9000	0.8982	5	–1.14	0.25
		2004		126	100,557	0.00130	154	100,023	0.00150	1.0050	0.8230	0.8189	5	–1.67	0.09
		2005	Y	1,116	89,159	0.01250	984	87,801	0.01120	1.0150	1.1350	1.1182	5	2.55	0.01
		2006		109	96,305	0.00110	86	95,382	0.00090	1.0100	1.2670	1.2545	4	1.58	0.11
		2007		866	99,632	0.00870	871	99,465	0.00880	1.0020	0.9940	0.9920	3	–0.15	0.88
		2008		175	99,944	0.00180	168	99,451	0.00170	1.0050	1.0420	1.0368	2	0.33	0.74
N PUGET SOUND	NSF	1998		772	168,574	0.00458	699	167,136	0.00419	1.0086	1.1043	1.0949	5	0.77	0.44
		1999		387	200,294	0.00193	509	198,085	0.00257	1.0112	0.7589	0.7505	5	–1.96	0.05
		2000		213	199,511	0.00107	199	197,364	0.00101	1.0109	1.0728	1.0613	5	0.38	0.71
		2001	Y	336	98,860	0.00339	406	97,528	0.00416	1.0137	0.8268	0.8157	5	–2.68	0.01
		2002		24	206,479	0.00012	27	203,675	0.00013	1.0138	0.8891	0.8770	5	–0.47	0.64
		2003		79	198,270	0.00040	76	202,184	0.00037	0.9806	1.0415	1.0620	5	0.37	0.71
		2004		46	185,400	0.00025	30	179,380	0.00016	1.0336	1.5530	1.5026	5	1.73	0.08
		2005		228	204,021	0.00112	210	203,918	0.00103	1.0005	1.0820	1.0814	5	0.81	0.42
		2006		41	134,773	0.00031	28	143,841	0.00020	0.9370	1.4587	1.5568	5	1.81	0.07
		2007		207	206,670	0.00100	170	206,867	0.00082	0.9990	1.2190	1.2201	4	1.92	0.05
		2008		112	175,656	0.00064	90	171,083	0.00052	1.0267	1.2471	1.2147	3	1.37	0.17
		2009		9	197,619	0.00005	10	195,706	0.00005	1.0098	0.9001	0.8914	2	–0.25	0.80
	SAM	1998		831	198,241	0.00419	953	196,029	0.00486	1.0113	0.8719	0.8622	5	–1.72	0.09

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Table 4.5 *Page 2 of 4.*

Stock		Brood Year	Signature?	Unmarked			Marked						Oldest age in brood	Z-statistic for H(o) of no impact	p(0.05)
				Ret	Rel	Prop. Ret	Ret	Rel	Prop. Ret	λ rel	λ esc	Odds Ratio			
N PUGET SOUND (cont)	SAM (cont)	1999		311	177,940	0.00175	276	168,423	0.00164	1.0565	1.1258	1.0655	5	0.39	0.70
		2000	Y	65	149,187	0.00043	112	146,129	0.00077	1.0209	0.5787	0.5669	5	−2.51	0.01
		2001	Y	176	169,452	0.00104	96	173,971	0.00055	0.9740	1.8385	1.8876	5	2.70	0.01
		2002		137	199,133	0.00069	135	197,111	0.00068	1.0103	1.0139	1.0036	5	0.02	0.98
		2003		330	195,566	0.00169	331	200,153	0.00165	0.9771	0.9973	1.0207	5	0.20	0.84
		2004		189	201,803	0.00094	209	196,576	0.00106	1.0266	0.9039	0.8805	5	−0.94	0.35
		2005		802	182,920	0.00438	778	201,655	0.00386	0.9071	1.0307	1.1362	5	1.65	0.10
		2006		270	205,708	0.00131	223	206,496	0.00108	0.9962	1.2089	1.2135	5	1.37	0.17
		2007		871	216,849	0.00402	741	211,571	0.00350	1.0249	1.1747	1.1462	4	1.27	0.21
		2008		140	201,990	0.00069	133	201,764	0.00066	1.0011	1.0531	1.0519	3	0.42	0.68
		2009	Y	220	203,497	0.00108	170	202,005	0.00084	1.0074	1.2976	1.2881	2	2.47	0.01
	SKS	1998		77	67,098	0.00115	77	65,619	0.00118	1.0225	0.9990	0.9769	5	−0.08	0.94
		1999		857	72,629	0.01180	816	71,246	0.01146	1.0194	1.0500	1.0300	5	0.55	0.59
		2000		780	73,356	0.01063	778	74,091	0.01050	0.9901	1.0026	1.0126	5	0.25	0.80
		2001		649	72,996	0.00890	620	76,520	0.00811	0.9539	1.0471	1.0976	5	1.66	0.10
		2002	Y	561	60,000	0.00935	436	59,777	0.00730	1.0037	1.2866	1.2819	5	3.92	0.00
		2003	Y	340	75,418	0.00451	243	74,590	0.00326	1.0111	1.3971	1.3818	5	3.86	0.00
		2004	Y	720	71,942	0.01001	466	73,668	0.00633	0.9766	1.5431	1.5801	5	7.71	0.00
		2005	Y	121	74,467	0.00163	88	74,633	0.00118	0.9978	1.3767	1.3798	5	2.30	0.02
		2006	Y	216	66,540	0.00325	186	70,079	0.00265	0.9495	1.1631	1.2249	5	2.02	0.04
		2007	Y	247	58,614	0.00422	192	58,502	0.00328	1.0019	1.2897	1.2872	4	2.62	0.01
		2008	Y	161	75,683	0.00212	92	76,752	0.00120	0.9861	1.7473	1.7720	3	4.41	0.00
	SKY	2000		389	209,520	0.00186	358	205,008	0.00175	1.0220	1.0876	1.0642	5	0.78	0.43
		2001		243	197,946	0.00123	245	196,023	0.00125	1.0098	0.9935	0.9839	5	−0.17	0.86
		2002	Y	408	197,105	0.00207	325	195,075	0.00167	1.0104	1.2549	1.2420	5	2.83	0.00
		2003	Y	469	173,116	0.00271	416	176,427	0.00236	0.9812	1.1277	1.1493	5	1.99	0.05
		2004	Y	966	199,529	0.00484	814	200,398	0.00406	0.9957	1.1861	1.1913	5	3.51	0.00
		2005		239	206,091	0.00116	204	204,637	0.00100	1.0071	1.1735	1.1652	5	1.54	0.12
		2006		297	206,362	0.00144	290	205,344	0.00141	1.0050	1.0235	1.0185	5	0.21	0.83
		2007		250	199,678	0.00125	222	199,858	0.00111	0.9991	1.1287	1.1297	4	1.29	0.20
		2008		136	202,000	0.00068	122	201,196	0.00061	1.0040	1.1190	1.1145	3	0.85	0.39
		2009		1	200,265	0.00000	4	201,000	0.00002	0.9963	0.2475	0.2484	2	−1.35	0.18
		2008		136	202,000	0.00068	122	201,196	0.00061	1.0040	1.1190	1.1145	3	0.85	0.39
		2009		1	200,265	0.00000	4	201,000	0.00002	0.9963	0.2475	0.2484	2	−1.35	0.18

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Table 4.5 *Page 3 of 4.*

Stock		Brood Year	Signature?	Unmarked			Marked								
				Ret	Rel	Prop. Ret	Ret	Rel	Prop. Ret	λ rel	λ esc	Odds Ratio	Oldest age in brood	Z-statistic for H(o) of no impact	p(0.05)
S PUGET SOUND	GAD	1998		700	224,228	0.00312	677	223,343	0.00303	1.0040	1.0338	1.0297	5	0.54	0.59
		1999		501	218,728	0.00229	446	208,330	0.00214	1.0499	1.1234	1.0700	5	1.04	0.30
		2000		508	225,071	0.00226	480	223,009	0.00215	1.0092	1.0586	1.0489	5	0.75	0.45
		2001		493	210,039	0.00235	509	223,933	0.00227	0.9380	0.9683	1.0324	5	0.50	0.62
		2002		912	208,727	0.00437	859	209,531	0.00410	0.9962	1.0618	1.0659	5	1.33	0.18
		2003	Y	601	223,637	0.00269	508	224,905	0.00226	0.9944	1.1815	1.1882	5	2.79	0.01
		2004		307	223,927	0.00137	280	224,882	0.00124	0.9958	1.0993	1.1040	5	1.16	0.25
		2005	Y	1,412	225,257	0.00627	1,224	225,216	0.00543	1.0002	1.1539	1.1537	5	3.54	0.00
		2006		478	225,937	0.00212	418	215,124	0.00194	1.0503	1.1451	1.0903	5	1.26	0.21
		2007	Y	1,912	221,008	0.00865	1,546	219,881	0.00703	1.0051	1.2367	1.2303	4	6.04	0.00
		2008	Y	352	225,942	0.00156	287	226,985	0.00126	0.9954	1.2253	1.2309	3	2.60	0.01
		2009		793	227,548	0.00348	726	227,151	0.00319	1.0017	1.0927	1.0908	2	1.68	0.09
	GRN	1997		124	204,024	0.00061	129	203,028	0.00064	1.0049	0.9597	0.9550	5	−0.37	0.71
		1998		644	197,824	0.00326	592	188,118	0.00315	1.0516	1.0881	1.0348	5	0.60	0.55
		1999		273	197,889	0.00138	264	193,300	0.00137	1.0237	1.0329	1.0090	5	0.10	0.92
		2000		223	202,658	0.00110	197	194,248	0.00101	1.0433	1.1314	1.0844	5	0.82	0.41
		2001	Y	108	162,160	0.00066	88	178,119	0.00049	0.9104	1.2296	1.3506	5	2.08	0.04
		2002	Y	493	198,321	0.00248	550	192,443	0.00286	1.0305	0.8957	0.8692	5	−2.26	0.02
		2003		282	197,541	0.00143	246	197,726	0.00125	0.9991	1.1433	1.1444	5	1.54	0.12
		2004	Y	578	204,269	0.00283	507	204,698	0.00248	0.9979	1.1381	1.1404	5	2.14	0.03
		2005	Y	948	198,542	0.00477	823	196,353	0.00419	1.0111	1.1519	1.1392	5	2.70	0.01
		2006	Y	427	204,385	0.00209	365	204,795	0.00178	0.9980	1.1700	1.1723	5	2.19	0.03
		2007	Y	809	202,635	0.00399	671	202,671	0.00331	0.9998	1.2051	1.2053	4	3.53	0.00
		2008		75	212,303	0.00035	81	201,409	0.00040	1.0541	0.9228	0.8755	3	−0.82	0.41
		2009		37	199,610	0.00018	39	195,191	0.00020	1.0226	0.9460	0.9250	2	−0.34	0.74
	GRO	1999		1,219	180,536	0.00675	1,141	181,132	0.00630	0.9967	1.0686	1.0721	5	1.69	0.09
		2000		693	206,563	0.00336	647	203,754	0.00318	1.0138	1.0703	1.0558	5	0.99	0.32
		2001		532	203,840	0.00261	486	203,509	0.00239	1.0016	1.0943	1.0925	5	1.41	0.16
		2002		875	194,233	0.00451	851	198,987	0.00428	0.9761	1.0291	1.0543	5	1.10	0.27
		2003	Y	1,431	151,492	0.00945	1,348	163,799	0.00823	0.9249	1.0620	1.1483	5	3.65	0.00
		2004	Y	1,133	133,455	0.00849	872	118,197	0.00738	1.1291	1.2987	1.1502	5	3.06	0.00
		2005	Y	1,136	169,954	0.00668	1,084	136,519	0.00794	1.2449	1.0476	0.8415	5	−3.74	0.00
		2006		875	185,397	0.00472	862	185,975	0.00464	0.9969	1.0144	1.0176	5	0.34	0.74

–continued–

Table 4.5 *Page 4 of 4.*

Stock		Brood Year	Signature?	Unmarked			Marked								
				Ret	Rel	Prop. Ret	Ret	Rel	Prop. Ret	λ rel	λ esc	Odds Ratio	Oldest age in brood	Z–statistic for H(o) of no impact	p(0.05)
S PUGET SOUND (cont)	GRO (cont)	2007		1,928	199,622	0.00966	1,955	199,251	0.00981	1.0019	0.9861	0.9843	4	–0.47	0.64
		2008		391	200,006	0.00195	348	186,978	0.00186	1.0697	1.1226	1.0494	3	0.64	0.52
		2009		359	193,417	0.00186	327	200,431	0.00163	0.9650	1.0975	1.1373	2	1.67	0.10
	NIS	1998	Y	668	192,165	0.00348	485	202,103	0.00240	0.9508	1.3766	1.4478	5	6.00	0.00
		1999		508	194,985	0.00260	486	199,030	0.00244	0.9797	1.0449	1.0666	5	1.01	0.31
		2000		590	174,625	0.00678	585	169,143	0.00698	2.0710	2.0127	1.9451	5	–0.69	0.49
		2001		403	214,059	0.00376	368	214,490	0.00343	1.9962	2.1797	2.1859	5	1.71	0.09
		2002	Y	1,071	192,248	0.01113	808	180,294	0.00897	2.1341	2.6494	2.4876	5	6.50	0.00
		2003	Y	1,235	203,624	0.00607	1,096	207,975	0.00527	0.9791	1.1273	1.1513	5	3.30	0.00
		2004	Y	1,102	209,905	0.00525	924	208,724	0.00443	1.0057	1.1931	1.1864	5	3.71	0.00
		2005	Y	675	127,293	0.00530	512	120,154	0.00426	1.0594	1.3194	1.2454	5	3.61	0.00
		2006	Y	445	204,613	0.00217	352	204,221	0.00173	1.0019	1.2630	1.2606	5	2.93	0.00
		2007	Y	1,435	179,625	0.00799	1,229	180,974	0.00679	0.9925	1.1677	1.1765	4	3.88	0.00
		2008	Y	357	206,098	0.00173	291	206,480	0.00141	0.9981	1.2264	1.2287	3	2.49	0.01
		2009		259	201,544	0.00128	244	201,099	0.00121	1.0022	1.0608	1.0585	2	0.62	0.53

[1] A positive Z-statistic indicates that more unmarked fish returned than marked while negative Z-statistics indicate that the return proportion was greater for marked groups than for unmarked groups.

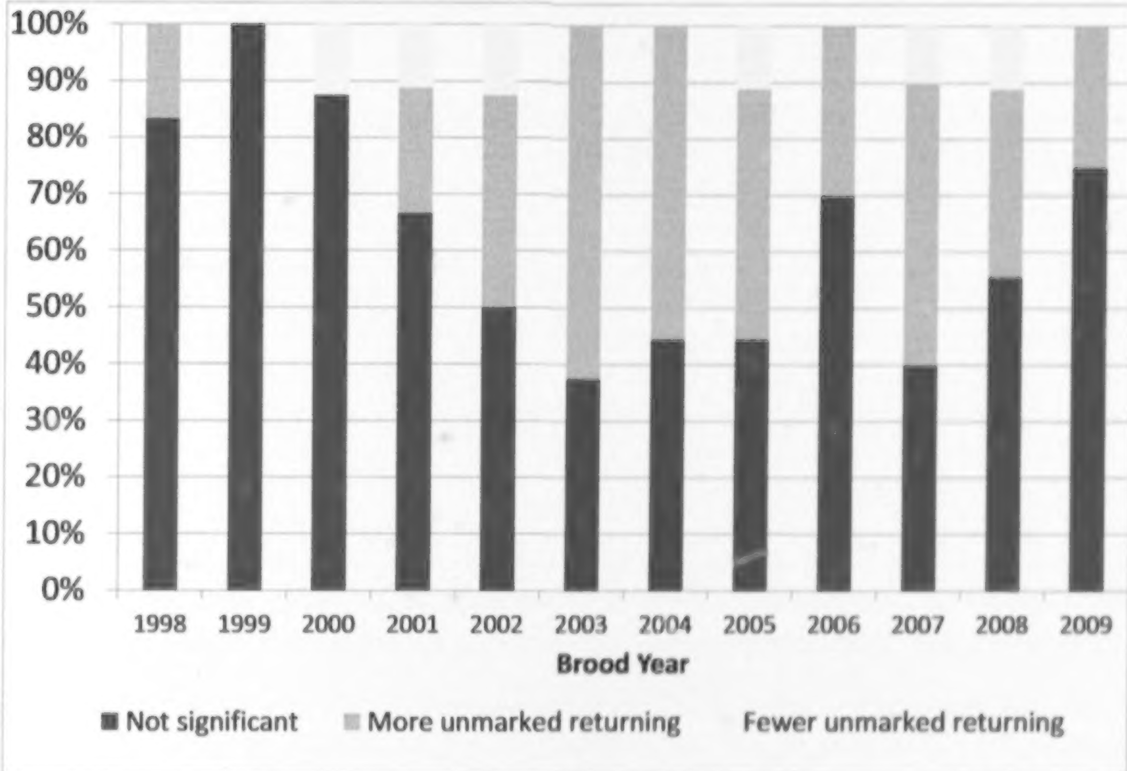

Figure 4.4 *The percentage of DIT stock statistical test results reported in Table 4 and Table 5 that compare the lambdas at release and escapement by BY. Test results were grouped as showing no significant difference, significantly fewer marked fish returning, or significantly fewer unmarked fish returning.*

Note: 2001 is the first BY for which all ages were exposed to MSFs; recoveries for BY 2009 are for age-2 fish only.

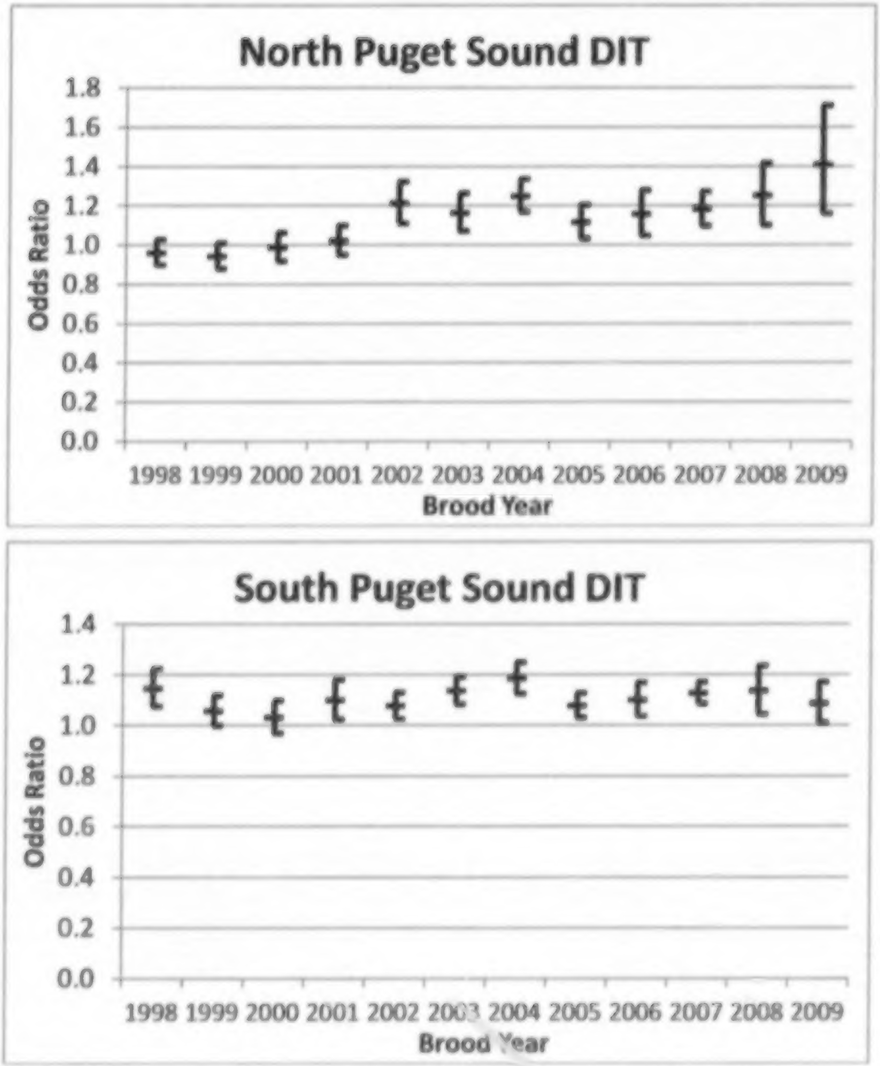

Figure 4.5. Estimated odds ratios (+/–95% confidence interval) for Puget Sound Chinook salmon DIT stocks combined.

Note: 2001 is the first BY for which all ages were exposed to MSFs; recoveries for the most recent BY are for age-2 fish only.

5 PROGRESS REPORT ON IMPROVEMENTS TO THE COASTWIDE CWT PROGRAM

5.1 Background

The Chinook chapter of Annex IV of the 2009 PST Agreement provides a directive for a Coded Wire Tag Improvement Program (CWTIP) in paragraph 3(b) as follows:

> "... to provide $7.5 million each in their respective currencies (subject to the availability of funds) to implement over a five year period beginning no later than 2010 within their respective jurisdictions critical improvements to the coastwide coded wire tagging program operated by their respective management agencies."

The Commission established a bilateral Coded Wire Tag Improvement Team (CWTIT) in November of 2009 to provide annual recommendations to the Commission and the Parties and to implement improvements as identified in the PSC Technical Report Number 25 (PSC 2008). Although Parties prioritize actions based on their specific requirements to improve the precision and accuracy of statistics used by the CTC in support of the Chinook management regime, the CWTIT also performs a coordination role to optimize the benefits of the CWT programs operated in the various jurisdictions through an annual workshop and other coordination activities.

The CWTIT is required to report annually to the Commission each January and to document progress to date in the annual CTC reports. The results for past funding (2009–2011) are reported in CTC (2012a, 2012b, and 2013). The format for reporting has been changed this cycle. A summary of the CWTIP to date is provided here, along with projects that were approved for funding in 2013. Details for individual projects, including description, cost, accomplishments, and benefits, is provided for each project funded in 2012 in Appendix L.

Canada implemented the program in 2009, a year earlier than the U.S., due to differences in the timing of fiscal year cycles. The final year of funding for this initiative in Canada is scheduled for 2013–2014 and in the U.S. through 2014–2015. Total expenditures by the Parties are reported in Table 5.1 according to issues identified in PSC Technical Report 25 (PSC 2008). The projects in Table 5.1 follow general improvements in CWT tagging or sampling and harvest or escapement estimation, and/or improvements in data coordination and reporting.

Canada has invested close to $1.5 million annually on a total of 57 individual projects. The majority of investment has occurred on multiyear projects for improvements to CWT tagging, sampling, harvest and escapement estimation. The U.S. has invested $1.5 million annually on a total of 37 individual projects. Like Canada, the majority has been spent on similar improvements, as well as a portion of funding for major upgrades to the CWT reporting systems in Oregon and Washington, and minor upgrades to the same in Alaska.

In addition to funding provided by the Parties, Northwest Marine Technology, Inc. has worked with agencies to defray costs of increasing tagging levels, and to reduce costs and improve availability of equipment, such as CWT detectors. The objective of these measures is to reduce uncertainties about CWT-derived statistics.

Table 5.1 Regional priority and total investment 2009–2012 in issues identified in PSC Technical Report 25 (PSC 2008).

		Canada			US		
Issue #	**PSC Technical Report 25 Issue**	**Priority TR 25[1]**	**Total Funding**	**% Funding**	**Priority TR 25[1]**	**Total Funding**	**% Funding**
CWT Tagging and Sampling							
1	Representation of Production Regions	H	$623,761	10.5%		$829,217	18.4%
2	Determination of Tagging Levels	M-H	$1,885,099	31.8%		$109,160	2.4%
3	Representation o f Hatchery Production	L	$5,500	0.1%		$124,349	2.8%
4	Low Sampling Rates in Terminal Fisheries	M_H	$482,420	8.1%		$389,313	8.7%
5	Low Sample Rates in Escapements	L-M	$339,390	5.7%		$5,628	0.1%
6	Uncertainty in Estimates of Escapement or Catch	L-H	$359,370	6.1%		$124,992	2.8%
7	Low Sample Rates in Highly Mixed Stock Fisheries	L-M	$324,020	5.5%		$1,219,115	27.1%
8	Uncertainty in Estimates of Catch in Mixed Stock Fisheries	M-H	$286,600	4.8%		$14,843	0.3%
9	Non-representative Sampling	M-H	$267,530	4.5%		$111,604	2.5%
10	Incomplete Coverage of Fisheries or Escapement	L-M	$460,645	7.8%		$111,184	2.5%
11	Voluntary Sport Fishery Sampling Programs	H	$293,860	5.0%		$0	0.0%
12	Sampling to Facilitate MSF Evaluations	L	$73,250	1.2%		$155,792	3.5%
	Subtotal		**$5,401,445**			**$3,195,196**	
Data Coordination and Reporting							
13	Timeliness of Reporting	H	$154,700	2.6%		$433,615	9.6%
14	Incomplete/No Exchange of CWT Data		$122,600	2.1%		$258,165	5.7%
15	Inter/Intra Agency Coordination	M	$104,300	1.8%		$82,775	1.8%
16	Unclear Authority to Enforce/Establish Protocols		$0	0.0%		$0	0.0%
17	Updating CWT Data is Difficult/Cannot Be Tracked		$70,000	1.2%		$124,716	2.8%
18	Validation is Inadequate For Current Uses of CWT Data		$70,000	1.2%		$142,937	3.2%
19	Lack of Formal Designation of RMPC as US Public Database & Lack of Adequate Funding Support		$0	0.0%		$115,444	2.6%
DTT	Funding Guidance		$0	0.0%		$141,586	3.2%
	Subtotal		**$521,600**			**$1,299,237**	
	2009–2012 Total		**$5,923,045**			**$4,494,433**	

[1] The Canadian summary is for four years and the U.S. summary is for three years. Issue priority: L = low, M = medium, H = high.

5.2 Benefits and Performance of CWT Improvements to Date

Some individual projects listed in Table 5.1 may address multiple issues. This is due the relationship of the multiple issues in three general categories identified in PSC Technical Report 25 (PSC 2008). The anticipated results of CWTIT-funded projects can be usefully categorized as legacy, operational, and data improvements.

Legacy projects are those that will provide lasting improvements to ongoing database and reporting issues, reduce costs, or improve efficiencies. Examples of legacy projects include the following.

1. Fisheries and Oceans Canada (DFO) Salmonid Enhancement Program (SEP) database improvements: This project will improve CWT data coordination and reporting procedures, and develop a formal set of Best Practices for the coordination (collection, transfer and management) of CWT Chinook heads and data at all DFO escapement projects. Archived escapement data from DFO enhancement programs are being reviewed to ensure that standardized analytical techniques and data verification procedures have been employed.
2. DFO Mark–Recovery Program (MRP) database and data exchange improvements: DFO has made significant progress in reviewing and converting the legacy FORTRAN system to current technology and improving interfaces within DFO reporting systems (e.g., hatcheries system, catch monitoring system, and escapement systems). The query interface has also been updated for increased speed and end-user versatility. These projects will provide lasting benefits for reconciling timeliness and access to information for data exchange in the Regional Mark Information Centre. Data improvements include clarified techniques for validation and corrections to data and historical algorithms.
3. Improvements to the DFO Fisheries Operating System (FOS) commercial database: This will establish standard protocols for reporting and will improve timeliness of reporting and availability of final commercial catch estimates including test fishing data.
4. Updating and integration of Oregon's computer programs: This will improve the consistency, timeliness, and accuracy of CWT data reporting.
5. Updating several aspects of Washington's CWT reporting system: This will improve the consistency, timeliness, data retrieval and accuracy of CWT data reporting.
6. Development of a Decision-Theoretic Tool: This tool will be used for planning individual or multiple CWT improvement programs (e.g., tagging, sampling, catch/escapement estimation).
7. Equipment such as CWT detectors and microscopes will be purchased new or replaced.
8. Developing indirect methods to estimate CWT recoveries, by age and stock in freshwater sport fisheries from the three-year study in Puget Sound: This will provide the basis to refine past and future estimation.

Operational projects are of three general types: projects to maintain existing capabilities; projects that reduce costs of sampling, processing, or reporting CWT data or improving the

timeliness of availability; and projects that evaluate the feasibility of developing and applying new estimation methods. Examples of operational projects include the following.

1. Increasing coverage and sampling of terminal fisheries (e.g., Central Coast marine and fresh water sport, Strait of Georgia marine sport, Chilliwack River sport and Lower Fraser First Nations fisheries) will result in increased accuracy and precision of exploitation rate estimation for CWT indicator stocks.

2. Increased effort in monitoring and sampling indicator escapement programs will result in increased accuracy and precision of indicator cohort abundance, survival rates, and exploitation rates.

3. Mark–Recovery Program (MRP), Fisheries Operating System (FOS), and Salmonid Enhancement Program (SEP) database improvements will provide more timely and accurate reporting of CWT data and access to data required for assessing fishery impacts.

4. Surrogate (indirect) data methods will be used to estimate CWT recoveries in sport fisheries.

5. The use of detection wands in SEAK will reduce freight and CWT lab storage and processing costs by not shipping heads from adipose-clipped salmon without CWTs.

It has been difficult at times to separate improvement projects from programs conducted by agencies using other core funding because of the close association and need of multiple funding sources. For example, in Canada some CWTIT projects were developed to estimate costs and quality of information that would result from the redesign of CWT sampling programs. In the U.S., operational projects have included funding provided to address the loss of funding from *Anadromous Fish Act* grants for CWT sampling in Washington and Oregon. Operational projects have also included projects to evaluate the feasibility of methods to reduce costs or improve the timelines of providing CWT data.

Data Improvement projects involve indicator stock tagging and sampling programs to fill information gaps. The full realization of the improvements resulting from these types of CWT projects depends upon the availability of funding beyond the anticipated end of the CWTIT program. Examples of such projects include increased representation of production regions by indicator systems (e.g., Fraser River, Philips River south coast mainland inlets, Atnarko River central coast B.C., Oregon coastal stocks, and Southeast Alaska stocks). For indicator stock programs, some of the data produced by CWTIP projects will not become available until after the anticipated end of CWTIP funding (Table 5.2). CWTs from augmented CWT releases were encountered in two-year-old Chinook in fishery and escapement sampling programs in 2011, but all possible marine ages will not be represented until at least 2015 or later (Table 5.2). A more detailed analysis of the impacts of the increased CWT releases will be provided in a future year.

Annual program review by CWTIT provides a means to monitor and evaluate the status of the CWT program. The CWTIP has improved communication and collaboration among agencies. CWTIT workshops have provided opportunities for agency staff involved in all aspects of the

CWT program (i.e., tagging, monitoring, analysis, data management, etc.) to share information and expertise to improve the CWT program through the exchange of information, discussion of issues, and experience.

Table 5.2 Year of incremental tag application and anticipated tag recovery by age.

Calendar Year	Tag Application	Tag Recovery by age			
		2	3	4	5
2009	Y[1]				
2010	Y	Y			
2011	Y	Y	Y		
2012	Y	Y	Y	Y	
2013	Planned	NA[1]	NA	NA	NA
2014		NA	NA	NA	NA
2015			NA	NA	NA
2016				NA	NA
2017					NA

[1] Y = Yes; NA = Not Available until future return years.

5.3 Developing Issues

Although the CWTIP has delivered many positive benefits to the CWT system, some issues were identified as the program has proceeded.

Timing and availability of funds has hampered some U.S. projects from beginning at the planned date because of delays in receiving funds due to unanticipated complications in completing the grant process for some agencies/entities and federal appropriations and budgeting processes. In some cases, projects which were approved in February did not begin until 9–10 months after that time.

Inflation has eroded the buying power of the funding available through the CWTIT program due to increases in personnel, transportation, freight, equipment, and other costs.

The initial funding commitment of $15 million over a five-year period was insufficient to make needed, lasting improvements to the CWT program just for Chinook. Improvements are also needed for coho and in systemic programs that affect multiple species (e.g., estimation, sampling, and reporting of catches and escapements, separation of hatchery and wild components, methods to assess impacts of mass marking and mark-selective fisheries).

The potential for future reductions in funding to support CWT programs is a major concern. Management agencies of both Parties are experiencing substantial pressures for fiscal austerity. In the U.S., a means to provide funding to support continuation of base-level ocean sampling in Washington and Oregon to address budgetary pressures from the loss of *Anadromous Fish Act* grants has not been addressed to date. Agencies are evaluating alterations to tagging and sampling programs, and major funding agencies like the Bonneville Power Administration are reviewing future commitments for CWT-related efforts.

5.4 Long-term Issues

CWTs remain the only tool that can provide the information needed for coastwide fishery management and assessment. This is especially true because CWTs provide stock- and age-specific identification without error (i.e., the tag code is from a specific hatchery or wild stock from a specific year class), and CWTs provide the established mechanisms for coastwide data sharing and broadly agreed methods for statistical analysis. Other tools have been used for various management or stock assessment objectives, primarily for region-specific applications, but these other tools do not provide the tools necessary to implement the PST and they are more costly. The CWT program provides the most reliable series of continual data used in estimating stock abundances and fishery impacts.

The CWTIT program is scheduled to sunset in 2013/2014 for Canada and in 2014/2015 for the U.S. A means to continue funding is needed for these improvements to be maintained. Projects such as indicator stock programs, tagging levels, sampling and recovery of tags, and data reporting, require sustained commitment of funding and staff resources. Funding from other sources, such as the Endowment Funds, which could provide funding to support CWT-related improvements is uncertain due to variability in investment performance and the need to provide funding to support other PSC initiatives, like the Sentinel Stocks Program. **Future funding is required to maintain the CWT program, and additional sources of funding to continue to improve it**. Since 2009, when this program was initiated, core agency monitoring and sampling programs have been reduced. In some cases, CWT improvement funds have been used as a temporary solution to cover emerging gaps in agency resources. The consequences of not adequately funding the CWT program in the future are numerous and include (1) not recovering the CWTs already in circulation, (2) reduced sampling rates and coverage coast wide, (3) reduced tagging levels, and (4) loss of a portion of the base agency ocean sampling in Washington and Oregon.

5.5 Canadian CWTIT Projects

5.5.1 Progress on Canadian Projects Undertaken in 2012

A total of 27 Canadian projects in 10 project categories were funded in FY 2012, representing a total expenditure of $1.5 million. These projects are summarized in Appendix L. Each project summary includes a description of the project, the CWT issue(s) listed in the PSC Technical Report 25 (PSC 2008), primary objectives, accomplishments, and benefits to the CWT program.

5.5.2 Canadian Projects Recommended for 2013

The Canadian CWTIT solicited projects to address priority issues identified in PSC Technical Report 25 (PSC 2008; Table 5.3) through an internal process which resulted in 33 projects recommended for funding, totaling $1.5 million. Both projects recommended for funding and contingency projects are listed in Table 5.4. The CWTIT believes that the recommended projects will provide short- and long-term benefits to the CWT program and benefits to abundance-based management of Chinook salmon under jurisdiction of the PST.

Table 5.3   Key to issues in PSC Technical Report 25 (CTC 2008).

CTC 2008 Issue No.	Description
1	Incomplete and inconsistent representation of production regions
2	Determination of tagging levels
3	Representation of hatchery production
4	Low sample rates in terminal fisheries
5	Low sample rates in escapements
6	Uncertainty in estimates of escapement or terminal fisheries
7	Low sample rates in highly mixed stock fisheries
8	Uncertainty in estimates of catch in high mixed stock fisheries
9	Non-representative sampling
10	Incomplete coverage of fisheries or escapement
11	Voluntary sport fishery sampling programs
12	Sampling methods to facilitate sampling of MSFs and CWT processing
13	Timeliness of reporting
14	Incomplete/no exchange of CWT data
15	Inter/intra-agency coordination
16	Unclear authority to establish and enforce standards
17	Updating data is difficult and updates cannot be tracked
18	Validation is inadequate
Chapter 6	Decision Theoretic Tool

Table 5.4 Canadian CWT Improvement Projects approved for FY2013.

Project Category	CTC (2008) Issue	Project Title	Cost ($CDN)
Increased CWT marking of Canadian indicators	2	Incremental tagging of 12 indicator stocks (Robertson Creek, Cowichan, Big Qualicum, Quinsam, Lower Shuswap, Nicola, Chilliwack, Harrison, Taku, Stikine, Kitsumkalum, and Atnarko)[1]	$358,500
Increased deadpitch CWT recovery effort, all indicators	5	Increased effort in CWT recovery in indicator escapement programs (Quinsam, Cowichan, Big Qualicum, Harrison, and Nicola)[1]	$80,500
Uncertainty in estimates of escapement or terminal fishery catch	1, 6	Atnarko Chinook CWT indicator stock[1]	$110,000
Agency staffing (Programmer, Catch QA/QC Analyst, CWT Recovery Coordinator)	4, 6, 7, 8, 9, 10, 11, 14, 15, 17, 18	Regional CWT Data System p\Programming, Regional CWT and Catch Estimation QA/QC, and Regional Sport and First Nations Fishery CWT Recovery Coordination[1]	$250,000
Increased head recovery costs	2, 4, 5, 7	CWT Head Lab Processing and Data Management[1]	$70,000
Low sample rates in terminal fisheries, sport and First Nations CWT recovery improvements	4, 7, 9, 10, 11	Regional Commercial, Sport, and First Nations Fishery CWT Recovery Improvements[1]	$215,000
Low sample rates in terminal fisheries, First Nations fishery CWT recovery improvements	4, 10	Improvements in CWT Recovery in Terminal First Nations Fisheries (Fraser River and Bella Coola)[1]	$80,000
Low sample rates in terminal fisheries, recreational fishery CWT recovery improvements	4, 10	Improvements in Catch Estimates and CWT Recovery in Terminal Recreational Fisheries[1]	$174,000
CWT data reporting system improvement	13, 15, 17	Database Improvements	$162,000
		GRAND TOTAL	$1,500,000

[1] Multiyear projects.

5.6 U.S. CWTIT Projects

5.6.1 Progress on U.S. Projects Undertaken in 2012

A total of 12 U.S. projects were funded in FY 2012, representing a total expenditure of $1,529,685. These projects are presented in summary fashion in Appendix L. Each project summary includes a description of the project, the CWT issue(s) listed in the PSC Technical Report 25 (PSC 2008) and in Table 5.3, primary objectives, accomplishments, and benefits to the CWT program.

5.6.2 U.S. Projects Recommended for 2013

Projects were solicited through a request for proposals released for two months in late 2012. Projects were evaluated by the CWTIT on the basis of those providing the most benefits to the CWT program for the associated cost. Table 5.5 provides a summary of the recommended

projects by project category. Project categories are based on the themes specified in PSC Technical Report 25 (PSC 2008). Projects were scored and ranked individually by U.S. CWTIT members and consensus was subsequently reached to develop draft recommendations. These were deliberated by the bilateral CWTIT. The PSC approved the following list of recommendations. The projects recommended by the U.S. represent a complete expenditure of the $1.5 million available under this program for 2013. The CWTIT believes that the recommended projects will provide short- and long-term benefits to the CWT program and benefits to abundance-based management of Chinook salmon under jurisdiction of the PST.

Table 5.5 U.S. CWT Improvement Projects approved for FY2013.

Project Category	TR 25 (PSC 2008) Issue	Project Title	Cost ($USD)
Replace outdated CWT equipment	12, 13	Replace WDFW Outdated Handheld CWT Wand Detectors[1]	$248,543
Low sample rates in mixed-stock fisheries	7	Sampling Washington Ocean Salmon Fisheries[1]	$354,492
Low sample rates in mixed-stock fisheries	7	SEAK Sport Catch Sampling[1]	$57,367
Indicator hatchery stock tagging, terminal fishery and escapement number and sampling	1,3, 4, 6	Mid-Oregon Coast CWT Recovery, and Escapement of Elk River Fall Chinook[1]	$125,195
Replace outdated CWT equipment	13	Purchase of Reading Stations at Alaska CWT Lab	$29,304
Reduce head processing costs & improve sampling efficiency	4, 7, 13	SEAK Commercial Port Sampling of Number Tags[1]	$58,164
Replace outdated CWT equipment	12, 13	Replace 30 Oregon Department of Fish and Wildlife outdated handheld CWT Wand Detectors	$101,063
Purchase new CWT equipment	13, 14, 17, 18	Purchase Data Loggers for 10 Hatcheries for Tag & Release Data Electronically & Train Staff	$99,653
Administrative	19	Partial Funding for Co-Chair	$14,820
Indicator stock tagging of wild stock without hatchery representation	1, 2	Chilkat River Chinook Smolt CWT[1]	$86,801
Indicator stock tagging of wild stock without hatchery representation	1, 2	Stikine River Chinook Smolt CWT–Bilateral[1]	$134,562
Low sample rates in mixed-stock fisheries	7, 8, 12	Improvements to Oregon Ocean CWT Sampling in Columbia River Mnagement Area	$112,597
CWT Lab equipment purchase and sampling	7, 10, 13	Purchase of T-Wands, Reading Station and Fishery Sampling—Makah Tribe	$46,459
CWT Lab and sampling equipment purchase	7, 13	Purchase of T-Wands and Reading Station—Lummi Tribe	$12,607
Administrative—CWT meeting costs	19	PSC—Fund Costs of next 2 CWTIT Workshop	$13,200
Purchase new CWT equipment	7, 13	Purchase of dissection and reading stations—Stillaguamish Tribe	$5,173
		GRAND TOTAL	$1,500,000

[1] Multiyear projects.

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PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE

2013 Exploitation Rate Analysis and Model Calibration
Volume Two: Appendix Supplement

TCCHINOOK (14)-1 V. 2

February 2014

LIST OF APPENDICES

Note: Product names used in this publication are included for completeness but do not constitute product endorsement.

Appendix A: Relationship between exploitation rate indicator stocks, escapement indicator stocks, model stocks, and additional management action stocks identified in the Pacific Salmon Treaty Annex

LIST OF APPENDIX A TABLES

Appendix A1. Indicator stocks for Southeast Alaska and Transboundary Rivers.

Area	Annex Stock Group[1]	Annex Indicator Stocks	Run Type	Escapement Indicator Stock	Escapement Objective[2]	Model Stock	Escapement Goal in Model[3]	Exploitation Rate Indicator Stock	CWT Acronym
SEAK/TBR			Spring	Taku	219,000–36,000[4]		9,110	Taku	TAK
				Stikine	14,000–28,000[4]			NA	
				Alsek	3,500–5,300			NA	
Yakutat				Situk	500–1,000[2]			NA	
SEAK Northern Inside				Chilkat	1,750-3,500[4]			Chilkat	CHK
				King Salmon	120–240[5]	Alaska South SE		Alaska Spring (Little Port Walter, Neets Bay Hatchery, Whitman Lake Hatchery, Deer Mountain Hatchery, Crystal Lake Hatchery)	AKS
SEAK Central Inside				Andrew Creek	650–1,500[5]				
SEAK Southern Inside				Unuk	1,800–3,800[4]				
				Chickamin	450–900[5]				
				Blossom	250–500[5]				
				Keta	175–400[5]				

Note: NA = not available.

[1] SEAK fisheries will be managed to achieve escapement objectives for Southeast Alaska and Transboundary River Chinook stocks.

[2] CTC escapement objective.

[3] Agency objective.

[4] Based on large spawners (ocean age 3 and older).

[5] Based on index count of large spawners (ocean age 3 and older).

Appendix A2. Indicator stocks for Canada.

Area	Annex Stock Group	Annex Indicator Stocks	Run Type	Escapement Indicator Stock	Escapement Objective[1]	Model Stock	Escapement Goal in Model[2]	Exploitation Rate Indicator Stock	CWT Acronym
NBC-Area 1	North/Central British Columbia	Yakoun	Summer	Yakoun	Escapement goal range by stock	North/Central B.C.	117,500	Kitsumkalum	KLM
NBC-Area 3		Nass	Summer	Nass					
NBC-Area 4		Skeena		Skeena					
CBC-Area 8			Spring/Fall	Rivers Inlet					
CBC-Area 9			Spring	Dean				Atnarko	ATN
WCVI	West Coast Vancouver Island Falls	Artlish, Burman, Gold, Kauok, Tahsis, Tashish, Marble	Fall	WCVI Aggregate (Artlish, Burman, Kauok, Tahsis, Tashish, Marble)	Escapement goal range for aggregate	WCVI Natural	42,734	Robertson Creek	RBT
						WCVI Hatchery	6,472		
Upper Strait of Georgia	Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	Summer/Fall	Upper Strait of Georgia (Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish)	Escapement goal range for aggregate	Upper Strait of Georgia	23,300	Quinsam	QUI
Lower Strait of Georgia	Lower Strait of Georgia		Summer/Fall			Lower Strait of Georgia Hatchery	5,318	Puntledge	PPS
								Big Qualicum	BQR
		Cowichan, Nanaimo	Fall	Lower Strait of Georgia (Cowichan/ Nanaimo)	Escapement goal range for aggregate	Lower Strait of Georgia Natural	21,935	Cowichan	COW
								Nanaimo	NAN
Fraser River	Fraser Early	Upper Fraser Mid Fraser Thompson	Spring	Fraser Spring run age 1.2	Escapement goal range by stock	Fraser Early	93,700	Nicola	NIC
				Fraser Spring run age 1.3				Dome	DOM
			Summer	Fraser Summer run age 1.3				NA	NA
				Fraser Summer run age 0.3				Lower Shuswap	SHU
	Fraser Late	Harrison River	Fall	Harrison River	75,100–98,500	Fraser Late	75,100	Chilliwack	CHI
								Harrison	HAR

[1] CTC escapement objective.
[2] Agency objective.

Appendix A3. Indicator stocks for Puget Sound.

Area	Annex Stock Group	Annex Indicator Stocks	Run Type	Escapement Indicator Stock	Escapement Objective[1]	Model Stock	Escapement Goal in Model[2]	Exploitation Rate Indicator Stock	CWT Acronym
North/ Central Puget Sound	North Puget Sound Natural Springs	Nooksack	Spring	Nooksack	Escapement goal range by stock	Nooksack Spring	4,000	Nooksack Spring Fingerling Nooksack Spring Yearling	NSF NKS
		Skagit		Skagit spring				Skagit Spring Fingerling Skagit Spring Yearling	SKF SKS
	Not an Annex stock		Fall			Nooksack Fall	11,923	Samish Fall Fingerling	SAM
	Puget Sound Natural Summer/Falls	Snohomish	Summer/ Fall	Snohomish		Snohomish Wild	5,250	Skykomish	SKY
		Skagit group		Skagit Summmer/Fall		Skagit Wild	9,778	Skagit Summer Fingerling	SSF
		Lake Washington		Lake Washington Falls		Puget Sound Natural Fingerling	16,966	NA	
		Green River		Green River				Green River Fingerling	GRN
		Stillaguamish		Stillaguamish		Stillaguamish Wild	2,000	Stillaguamish Fall Fingerling	STL
								Nisqually Fall Fingerling	NIS
Hood Canal	Not an Annex stock		Fall			Puget Sound Hatchery Fingerling		George Adams Fall Fingerling	GAD
South Puget Sound	Not an annex stock		Fall			Puget Sound Hatchery Fingerling	24,769	South Puget Sound Fall Fingerling	SPS
						Puget Sound Hatchery Yearling	9,136	South Puget Sound Fall Yearling	SPY
								Squaxin Pens Fall Yearling[3]	SQP
								Univ. of Washington Accelerated Fall[3]	UWA
			Spring					White River Spring Yearling	WRY

Note: NA = not available.
[1] CTC escapement objective.
[2] Agency objective.
[3] Production and tagging discontinued.

Appendix A4. Indicator stocks for the Washington Coast.

Area	Annex Stock Group	Annex Indicator Stocks	Run Type	Escapement Indicator Stock	Escapement Objective[1]	Model Stock	Escapement Goal in Model[2]	Exploitation Rate Indicator Stock	CWT Acronym
WA Coast/ Juan de Fuca	Washington Coastal Fall Naturals	Hoko	Fall	Hoko				Elwha Fall Fingerling	ELW
								Hoko Fall Fingerling	HOK
		Grays Harbor		Grays Harbor Fall	Escapement goal range by stock	Washington Coastal Wild	21,500	NA	
		Queets		Queets Fall				Queets Fall Fingerling	QUE
		Hoh		Hoh Fall				NA	
		Quillayute		Quillayute Fall				NA	
								Sooes Fall Fingerling	SOO
	Not an annex stock		Fall			Washington Coastal Hatchery	6,703	NA	
	Not an annex stock		Spring	Grays Harbor Spring				NA	
	Not an annex stock		Spring/ Summer	Queets Spring/Summer				NA	
				Hoh Spring/Summer				NA	
	Not an annex stock		Summer	Quillayute Summer				NA	

Note: NA = not available

[1] CTC escapement objective.

[2] Agency objective.

Appendix A5. Indicator stocks for Columbia River and Oregon Coast.

Area	Annex Stock Group	Annex Indicator Stocks	Run Type	Escapement Indicator Stock	Escapement Objective[1]	Model Stock	Escapement Goal in Model[2]	Exploitation Rate Indicator Stock	CWT Acronym
Columbia River	Not an Annex stock		Spring			Cowlitz Spring Hatchery	2,500	NA	CWS
						Willamette River Hatchery	13,500	Willamette Spring	WSH
	Columbia River Summers	Mid-Columbia Summers	Summer	Mid-Columbia Summer	17,857[3]	Columbia River Summer	17,857	Columbia Summers	SUM
	Columbia River Falls		Fall			Fall Cowlitz Hat.	8,800	Cowlitz Tule	CWF
						Spring Creek Hatchery	7,000	Spring Creek Tule	SPR
						Lower Bonneville Hatchery	26,200	Columbia Lower River Hatchery	LRH
		Upriver Brights		Columbia Upriver Bright	45,000	Columbia Upriver Brights	40,000	Columbia Upriver Bright	URB
								Hanford Wild	HAN
		Deschutes		Deschutes River Fall	4,532	Subset of Columbia Upriver Brights	4,000	NA	
						Lyons Ferry	3,430	Lyons Ferry	LYF
						Mid-Columbia River Brights	12,500	NA	
		Lewis River		Lewis	5,700	Lewis River Wild	5,700	Lewis River Wild	LRW
North Oregon Coast	Far North Migrating Oregon Coastal Falls	Nehalem	Fall	Nehalem	6,989	Oregon Coast	62,382	Salmon River	SRH
		Siuslaw		Siuslaw	12,925				
		Siletz		Siletz	2,944				
Mid-Oregon Coast	Not an Annex stock		Fall	Umpqua				Elk River	ELK
				Mid-South Oregon Coastal Falls					

Note: NA = not available.
[1] CTC escapement objective.
[2] Agency objective.
[3] Measured at Bonneville Dam.

APPENDIX B: ISBM INDICES

LIST OF APPENDIX B TABLES

Appendix B1. ISBM Indices for all British Columbia ISBM fisheries based on CWT-based exploitation rate analysis (1999–2011). The stock groups correspond to Annex 4, Chapter 3, Attachment IV of the 2009 Agreement. See footnotes in B5.

Stock Group	Escapement Indicator	CWT Indices[1]												
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Lower Strait of Georgia	Cowichan	0.517	0.196	0.260	0.247	0.363[2]	0.284	0.132	0.191	0.043	0.242	0.400	0.261	0.147
	Nanaimo[3]	0.163	0.154	0.260	0.247	NA[4]	NA	NA	NA	NA	NA	NA	NA	NA
Fraser Late	Harrison[5]	0.112	0.073	0.090	0.105	0.055[6]	0.032	0.058	0.032	0.035	0.031	0.058	0.134	0.092
North Puget Sound Natural Springs	Nooksack, Skagit	0.183	1.176	0.040	0.023	0.046	NA	NA	NA	NA	NA	0.106	0.014	0.014
		NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	0.021	0.123	0.040	0.063	0.006	0.018	0.028	0.079	0.268	0.073	0.247	0.182	0.032
Fraser Early (spring and summers)	Upper Fraser, Mid-Fraser, Thompson	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
West Coast Vancouver Island Falls	WCVI (Artlish, Burman, Kauok, Tahsis, Tashish, Marble)	0.431	0.083	0.060	0.248	0.496[8]	0.488	0.267	0.267	0.906	0.652	0.464	0.178	0.65
Puget Sound Natural Summer/Falls	Skagit	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Stillaguamish	0.194	0.111	0.145	NA	NA	0.027	0.057	0.074	0.192	NA	0.252	0.083	0.246
	Snohomish	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lake Wash.	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Green River	0.171	0.154	0.350	0.323	0.328	0.162	0.085	0.109	0.076	0.106	0.208	0.151	0.3
North/Central B.C.	Yakoun, Nass, Skeena, Area[6]	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix B2. ISBM Indices for all southern U.S. fisheries based on CWT-based exploitation rate analysis (1999–2011). The stock groups correspond to Annex 4, Chapter 3, Attachment V of the Pacific Salmon Treaty 2009 Agreement. See footnotes in B5.

Stock Group	Escapement Indicator	CWT Indices[1]												
		1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Washington Coastal Fall Naturals	Hoko	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Grays Harbor	0.430	1.630	0.860	0.540	0.150	0.530	0.560	0.520	0.790	0.390	0.700	0.690	0.923
	Queets	1.000	0.850	1.440	0.840	0.850	0.840	2.050	0.600	1.050	0.610	0.450	0.670	NA
	Hoh	1.540	2.750	1.660	0.950	1.340	1.220	1.030	1.290	2.230	0.950	1.220	1.000	2.003
	Quillayute	1.300	2.470	1.480	1.420	0.990	1.150	1.030	1.180	1.470	1.160	1.970	0.670	NA
Columbia River Falls	Upriver Brights	1.370	2.530	1.350	1.320	1.430	1.740	1.780	3.080	3.100	1.830	2.790	1.750	2.862
	Deschutes	0.510	0.710	0.520	0.590	0.049	0.510	0.670	0.580	0.510	1.860	2.360	0.790	0.798
	Lewis[5]	0.000	0.360	0.580	0.560	1.030	0.170	0.980	1.330	0.790	0.630	0.140	0.430	0.432
Puget Sound Natural Summer/Falls	Skagit	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Stillaguamish	0.120	0.040	0.890	NA	NA	0.010	0.220	0.080	0.120	NA[7]	0.200	0.380	0.195
	Snohomish	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lake Wash.	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Green River	0.500	0.700	1.180	1.070	1.030	1.010	0.170	0.370	0.380	0.280	0.290	0.340	0.439
Fraser Late	Harrison River[5]	0.470	0.130	0.310	0.410	0.640	0.320	NA[10]	NA	NA	NA	NA	NA	NA
Columbia R Summers	Mid-Columbia Summers[5]	1.640	4.820	5.320	7.250	10.040	2.690	6.080	0.480	1.840	6.800	1.310	9.810	5.376
Far North Migrating OR Coastal Falls	Nehalem[5]	1.960	1.970	1.940	2.170	3.110	1.800	2.000	3.480	2.010	0.920	0.590	1.210	1.210
	Siletz[5]	0.820	1.160	1.190	1.310	1.590	2.290	1.190	2.340	1.600	0.670	0.730	0.500	1.068
	Siuslaw[5]	1.220	2.450	2.180	2.560	3.820	1.030	1.630	2.230	1.000	0.640	1.070	0.770	1.108
North Puget Sound Natural Springs	Nooksack	0.440	0.000	0.040	NA[7]	NA	NA	NA	NA	NA	0.210	0.520	0.700	0.741
	Skagit	NA[7]	NA	NA	1.120	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix B3. ISBM Indices for all British Columbia fisheries, from the Chinook model (1999–2013) used to establish the AI for each year. The stock groups correspond to Annex 4, Chapter 3, Attachment IV of the Pacific Salmon Treaty 2009 Agreement. See footnotes in B5.

Stock Group	Escapement Indicator	Model Indices														
		1999 CLB0107	**2000** CLB0107	**2001** CLB0107	**2002** CLB0206	**2003** CLB0308	**2004** CLB0404	**2005** CLB0506	**2006** CLB0604	**2007** CLB0705	**2008** CLB0807	**2009** CLB0907	**2010** CLB1007	**2011** CLB1106	**2012** CLB1209	**2013** CLB1308
Lower Strait of Georgia	Cowichan	0.304	0.232	0.325	0.541	0.490	0.593	0.381[9]	0.590	0.240	0.315	0.494	0.203	0.367	0.443	0.362
	Nanaimo[3]	0.209	0.113	0.246	0.190	0.498	0.695									
Fraser Late	Harrison[5]	0.309	0.198	0.336	0.302	0.352	0.719	0.332	0.294	0.211	0.208	0.245	0.138	0.193	0.256	0.286
North Puget Sound Natural Springs	Nooksack, Skagit	0.233	0.156	0.241	0.195	0.251	0.273	0.314	0.993	0.563	0.470	0.988	0.568	0.732	0.339	0.273
		NA[7]	NA	NA	NA	0.251	0.273	0.314	0.993	0.563	0.470	0.988	0.568	0.731	0.340	0.273
Upper Strait of Georgia	Klinaklini, Kakweikan, Wakeman, Kingcome, Nimpkish	0.174	0.118	0.314	0.272	0.649	0.971	0.649	0.584	0.146	0.622	0.128	0.122	0.578	0.596	0.649
Fraser Early (spring and summers)	Upper Fraser, Mid-Fraser, Thompson	0.125	0.124	0.210	0.145	0.661	0.718	0.654	0.610	0.159	0.128	0.094	0.121	0.222	0.226	0.238
West Coast Vancouver Island Falls	WCVI (Artlish, Burman, Kauok, Tahsis, Tashish, Marble)	0.365	0.327	0.244	0.342	0.744	0.927	0.728	1.082	0.133	1.490	0.137	0.122	0.491	0.636	0.227
Puget Sound Natural Summer/Falls	Skagit	0.197	0.119	0.217	0.172	0.436	0.438	0.465	1.092	0.718	0.724	1.097	0.709	0.745	1.421	0.429
	Stillaguamish	0.355	0.234	0.469	0.375	0. 513	0.567	0.587	1.166	0.821	0.796	1.123	0.791	0.793	1.329	0.561
	Snohomish	0.185	0.116	0.222	0.176	0.435	0.445	0.457	1.101	0.736	0.721	1.098	0.718	0.744	1.359	0.423
	Lake Wash.	0.332	0.202	0.355	0.275	0.508	0.446	0.497[11]	0.898	0.735	0.722	0.918	0.690	0.752	0.991	0.419[11]
	Green River	0.333	0.202	0.356	0.275	0.508	0.466	0.497[11]	0.914	0.752	0.721	0.919	0.670	0.756	1.000	0.419[11]
North/Central B.C.	Yakoun, Nass, Skeena, Area[6]	0.237	0.254	0.613	0.584	0.689	0.804	0.680	0.626	0.202	0.593	0.224	0.177	0.598	0.536	0.496

Appendix B4. ISBM Indices for all southern U.S. fisheries, from the Chinook model (1999–2013) used to establish the AI for each year. The stock groups correspond to Annex 4, Chapter 3, Attachment V of the Pacific Salmon Treaty 2009 Agreement. See footnotes in B5.

Stock Group	Escapement Indicator	Model Indices														
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
		CLB0107	CLB0107	CLB0107	CLB0206	CLB0308	CLB0404	CLB0506	CLB0604	CLB0705	CLB0807	CLB0907	CLB1007	CLB1106	CLB1209	CLB1308
Washington Coastal Fall Naturals	Hoko	0.39	0.34	0.56	0.48	0.682	0.966	0.444	0.442	0.401	0.305	0.284	0.130	0.419	0.378	0.608
	Grays Harbor	0.440	0.430	0.450	0.840	0.494	0.573	0.222	0.544	0.504	0.45	0.404	0.382	0.549	0.604	0.547
	Queets	0.880	0.420	0.440	1.050	1.063	0.932	1.023	1.022	1.014	1.007	0.508	0.285	0.327	0.179	0.532
	Hoh	1.390	0.730	0.760	1.260	1.208	1.214	1.499	1.493	1.111	1.457	0.981	0.987	0.760	0.443	0.802
	Quillayute	1.140	0.720	0.750	1.310	1.292	1.139	1.133	0.673	0.883	0.851	0.881	0.963	1.058	1.151	1.442
Columbia River Falls	Upriver Brights	1.020	1.090	0.990	0.910	1.022	0.906	0.734	0.814	0.726	0.701	0.798	0.801	0.841	0.894	0.971
	Deschutes	1.020	0.880	0.740	0.550	0.561	0.475	0.483	0.437	0.493	0.428	0.461	1.004	1.044	0.684	0.718
	Lewis[5]	0.110	0.160	1.700	0.930	0.851	1.008	1.058	1.861	1.466	0.436	0.470	0.505	0.426	0.442	0.538
Puget Sound Natural Summer/Falls	Skagit	0.170	0.210	0.780	0.270	0.406	0.157	0.195	0.258	0.325	0.321	0.292	0.261	0.789	0.327	1.015
	Stillaguamish	0.140	0.140	0.400	0.200	0.184	0.224	0.185	0.493	0.152	0.137	0.446	0.117	0.169	1.054	0.213
	Snohomish	0.040	0.050	0.600	0.150	0.072	0.110	0.891	0.199	0.138	0.165	0.202	0.125	0.211	0.332	0.231
	Lake Wash.	0.500	0.480	0.590	1.250	0.768	0.411	0.373	0.613	0.391	0.392	0.768	0.517	0.387	0.590	0.404
	Green River	0.500	0.480	0.600	0.350	0.263	0.260	0.202	0.361	0.278	0.380	0.555	0.520	0.236	0.631	0.331
Fraser Late	Harrison River[5]	0.660	0.390	0.620	0.720	0.981	1.058	0.670	0.787	0.563	0.378	0.410	0.209	0.497	0.448	0.887
Columbia R Summers	Mid-Columbia Summers[5]	0.110	0.090	0.140	0.820	0.794	0.715	0.545	0.696	0.943	1.254	1.236	1.142	1.398	1.369	1.571
Far North Migrating OR Coastal Falls	Nehalem[5]	2.670	2.660	2.750	2.610	2.346	2.230	2.090	1.912	2.183	1.968	2.003	0.916	2.146	1.696	1.475
	Siletz[5]	1.810	1.790	1.870	1.330	1.302	1.288	1.233	1.237	1.399	1.592	1.217	0.698	0.643	0.814	0.679
	Siuslaw[5]	0.940	0.930	0.950	3.340	2.856	2.816	2.643	1.095	1.241	0.971	1.632	2.028	1.427	1.646	1.443
North Puget Sound Natural Springs	Nooksack	0.150	0.200	0.010	0.000	0.121	0.974	0.222	0.121	NA[7]	NA	0.107	0.181	0.484	0.171	0.330
	Skagit	NA[7]	NA	0.070	0.060	0.119	0.663	0.213	0.161	NA	NA	0.143	0.245	0.271	0.147	0.337

Appendix B5. Footnote definitions for Appendix B ISBM index Tables 1–4.

1 The CWT-based estimates, not the model estimates, are to be used in postseason assessments.

2 An inconsistency was discovered between the approaches used to calculate the model-based and CWT-based indices. The former included harvest rates for terminal sport while the latter did not. Terminal sport harvest rates are now included in the calculation of both indices starting 2003. Further review is yet required to determine whether the base period terminal sport harvest rates obtained from analyses of Big Qualicum CWT recoveries adequately represent impacts that would have occurred on Cowichan Chinook.

3 Indices for the Nanaimo stock are calculated from CWT recoveries for Cowichan; differences between Nanaimo and Cowichan stock indices are due to differences in terminal harvest.

4 Several problems have been identified in the approach previously used to calculate the CWT-based indices for Nanaimo Chinook; indices for this stock will not be reported starting 2003 as their utility is questionable.

5 Stock or stock group with an CTC-agreed escapement goal.

6 The terminal sport harvest rates for Chilliwack Hatchery Chinook, the indicator stock, were removed from the calculation for the Harrison River naturals starting 2003 because sport harvest has been essentially zero on the natural population.

7 NA means not available because of insufficient data (lack of stock specific tag codes, base period CWT recoveries, etc).

8 A review of the approach used to calculate both the CWT-based and model data-based indices for the WCVI naturals was carried out in 2008. A similar approach was adopted for both indices but due to modifications to the formerly used procedures, the historical time series of values was updated starting 2003.

9 Although model-based indices were previously calculated separately for Cowichan and Nanaimo Chinook; these did not adequately represent impacts on either Lower Strait of Georgia stock. This is because the model-based data represent an aggregate of the two stocks and methods do not currently exist to correctly disaggregate these data for calculation of the ISBM values. Until such methods are developed, a single index value only will be reported representing the aggregate starting 2007.

10 The U.S. CWT based indices for Fraser Late from 2005 onward do not accurately reflect the impacts on the natural stock because a considerable proportion of the recoveries in the U.S. fisheries have occurred in mark-selective fisheries in which only clipped hatchery-origin fish are retained. The U.S. indices since 2005 indicate greater impacts than would have occurred on the natural stocks and are no longer being reported.

11 For the Canadian ISBM fisheries, both Lake Washington and Green are assumed to have the same distribution and thus the same index value.

Appendix C: Percent distribution of total mortality among fisheries and escapement for exploitation rate indicator stocks by calendar year with analogous model stocks listed in parentheses

Landed catch distribution tables can be accessed at the following link: Landed Catch Distribution Tables.

These data result from cohort analysis of CWT recoveries for the indicator stocks; data within a row for each calendar year sum to 100%. Total mortality includes mortality in the form of landed catch and incidental, nonlanded mortality (i.e., release during nonretention periods, contact with gear, etc.). Landed catch is from direct observation programs and incidental mortalities are estimated based on sampling data and/or internal algorithms (i.e., size-at-age vulnerability algorithms and gear-specific mortality rates). Some changes are present in these distribution tables compared to those presented in previous reports due to changes in the CWT database. Values are not reported for a particular calendar year if there are less than 3 age classes present in that year or if there are less than 10 estimated CWTs in the reported catch and escapement. Where relevant, the escapement portion of the distribution includes mortalities resulting from interdam loss. Also, where escapement data is missing or only partially enumerated, those data are footnoted.

LIST OF APPENDIX C TABLES

LIST OF APPENDIX C TABLES (continued)

LIST OF APPENDIX C TABLES (continued)

Appendix C1. Percent distribution of Alaska Spring (Alaska South SE) total fishing mortalities among fisheries and escapement.

Catch	Estimated		AABM							ISBM													
	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	264	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1980	2056	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	1135	3,4,5	44.7%	3.3%	11.1%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.9%	31.3%
1982	3082	3,4,5,6	26.6%	5.2%	5.6%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	56.8%
1983	6600	3,4,5,6	34.1%	1.2%	8.3%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	51.2%
1984	12212	3,4,5,6	27.6%	2.5%	16.3%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	50.4%
1985	19113	3,4,5,6	28.4%	8.8%	13.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	2.1%	45.8%
1986	19562	3,4,5,6	26.8%	10.2%	12.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	3.7%	45.2%
1987	18816	3,4,5,6	34.0%	4.6%	7.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	7.2%	46.1%
1988	17173	3,4,5,6	31.5%	4.3%	10.5%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	6.9%	45.2%
1989	14563	3,4,5,6	22.9%	16.4%	9.4%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	5.1%	41.1%
1990	17332	3,4,5,6	36.6%	6.6%	10.2%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.6%	34.9%
1991	16039	3,4,5,6	37.0%	6.6%	10.0%	0.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%	34.1%
1992	10304	3,4,5,6	18.8%	31.9%	8.8%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	8.6%	31.2%
1993	6840	3,4,5,6	21.5%	7.3%	12.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	8.4%	47.8%
1994	8592	3,4,5,6	14.1%	36.5%	10.1%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	2.8%	33.2%
1995	7419	3,4,5,6	26.8%	12.7%	11.3%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	7.0%	33.0%
1996	6950	3,4,5,6	24.2%	7.5%	15.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%	14.0%	33.4%
1997	6152	3,4,5,6	24.6%	6.2%	14.6%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	17.6%	32.9%
1998	4352	3,4,5,6	25.0%	11.6%	13.7%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	14.3%	30.4%
1999	6767	3,4,5,6	20.8%	3.7%	16.8%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	13.7%	41.2%
2000	7265	3,4,5,6	23.3%	4.4%	13.4%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	11.7%	43.8%
2001	7341	3,4,5,6	17.1%	3.3%	10.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	9.0%	57.9%
2002	6429	3,4,5,6	12.8%	2.5%	9.9%	1.1%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	7.9%	62.4%
2003	6318	3,4,5,6	17.9%	2.2%	9.7%	0.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	59.0%
2004	9141	3,4,5,6	18.0%	7.0%	6.5%	0.5%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	9.3%	57.4%
2005	9195	3,4,5,6	26.2%	7.2%	13.2%	0.4%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	18.9%	33.3%
2006	11527	3,4,5,6	35.0%	4.7%	6.8%	0.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	9.6%	40.8%
2007	11468	3,4,5,6	31.3%	7.0%	6.6%	0.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	9.7%	43.5%
2008	10577	3,4,5,6	21.1%	4.7%	4.2%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	14.2%	54.3%
2009	8206	3,4,5,6	17.2%	4.7%	4.3%	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.0%	8.0%	59.1%
2010	6286	3,4,5,6	18.9%	5.6%	9.1%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	8.9%	55.6%
2011	6442	3,4,5,6	12.8%	9.7%	5.6%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	11.1%	56.5%
1979-2011	9781		25.1%	8.1%	10.2%	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	9.0%	44.8%
1979-1984	5757		33.2%	3.0%	10.3%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	47.4%
1985-1995	14159		27.1%	13.3%	10.5%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	6.6%	39.8%
1996-1998	5818		24.6%	8.5%	14.6%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	15.3%	32.2%
1999-2011	8228		20.9%	5.1%	9.0%	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	10.9%	51.1%

Appendix C2. Percent distribution of Atnarko River (North/Central B.C.) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													Esc.
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	6	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	37	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	145	2,3,4	20.7%	4.1%	0.0%	1.4%	1.4%	0.7%	0.0%	0.0%	0.0%	4.1%	14.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	50.3%
1991	757	2,3,4,5	7.7%	0.1%	0.0%	1.7%	2.1%	0.4%	0.0%	0.0%	0.0%	0.9%	20.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	1.3%	61.6%
1992	981	2,3,4,5,6	8.9%	0.0%	0.0%	1.8%	3.7%	0.3%	0.0%	0.0%	0.0%	5.3%	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	1.8%	56.4%
1993	1363	2,3,4,5,6	10.5%	0.9%	0.6%	4.5%	3.6%	0.4%	0.0%	0.0%	0.0%	1.2%	12.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	2.1%	60.9%
1994	1701	2,3,4,5,6	7.6%	0.2%	0.3%	1.5%	2.3%	0.0%	0.0%	0.0%	0.0%	2.6%	18.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.8%	64.5%
1995	2405	2,3,4,5,6	4.4%	0.1%	1.1%	1.1%	3.5%	0.0%	0.0%	0.0%	0.0%	0.3%	18.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	2.6%	63.6%
1996	2083	2,3,4,5,6	2.5%	0.0%	0.5%	0.2%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	13.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	4.5%	71.3%
1997	1193	2,3,4,5,6	4.5%	0.0%	1.5%	0.2%	3.9%	0.0%	0.0%	0.0%	0.0%	0.5%	10.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.2%	4.3%	66.2%
1998	1087	2,3,4,5,6	7.1%	0.0%	0.5%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	15.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	2.9%	57.8%
1999	1461	2,3,4,5,6	5.9%	0.0%	2.5%	0.0%	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%	3.6%	71.5%
2000	1051	2,3,4,5,6	6.5%	0.1%	0.0%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	7.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.9%	4.1%	70.4%
2001	706	2,3,4,5,6	6.7%	0.0%	1.6%	0.0%	3.1%	0.4%	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	9.3%	4.0%	59.8%
2002	771	2,3,4,5,6	5.2%	0.1%	0.5%	8.8%	6.1%	0.8%	0.0%	0.0%	0.0%	0.0%	17.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.0%	2.2%	51.4%
2003	646	2,3,4,5,6	4.8%	0.2%	0.0%	2.8%	16.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	30.5%	3.9%	41.0%
2004	691	2,3,4,5,6	9.8%	0.0%	0.0%	3.6%	11.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.9%	1.6%	44.3%
2005	945	3,4,5,6	12.9%	0.1%	0.8%	4.6%	16.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.6%	2.0%	40.4%
2006	1432	4,5,6	8.6%	0.0%	1.1%	2.2%	8.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	2.4%	64.5%
2007	409	2,5,6	11.5%	0.0%	2.4%	1.2%	9.3%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.5%	2.4%	50.1%
2008	151	2,3,6	6.6%	0.0%	0.7%	1.3%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.9%	0.0%	75.5%
2009	708	2,3,4	8.9%	0.0%	0.0%	2.8%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	34.9%	3.4%	44.1%
2010	805	2,3,4,5	10.6%	0.1%	0.6%	2.6%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.6%	2.0%	51.4%
2011	448	2,3,4,5,6	13.8%	0.0%	0.7%	8.5%	12.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.0%	3.6%	46.4%
2012	718	3,4,5,6	7.7%	0.7%	0.6%	1.7%	3.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.8%	0.0%	74.0%
1979-2012	985		8.4%	0.3%	0.7%	2.3%	6.1%	0.2%	0.0%	0.0%	0.0%	0.7%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	2.4%	58.1%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	1225		10.0%	0.9%	0.3%	2.0%	2.8%	0.3%	0.0%	0.0%	0.0%	2.4%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	1.5%	59.5%
1996-1998	1454		4.7%	0.0%	0.8%	0.1%	4.0%	0.0%	0.0%	0.0%	0.0%	0.2%	13.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.9%	3.9%	65.1%
1999-2012	782		8.5%	0.1%	0.8%	2.9%	8.0%	0.1%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.5%	2.5%	56.1%

Appendix C3. Percent distribution of Big Qualicum River Fall (Lower Strait of Georgia Hatchery and Natural) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	5102	2,3,4,5	4.4%	0.7%	0.5%	1.9%	0.4%	2.5%	0.1%	20.9%	15.2%	10.5%	11.9%	0.0%	0.0%	0.0%	0.1%	0.3%	0.0%	0.0%	0.0%	2.7%	27.8%
1980	2932	2,3,4,5	1.5%	1.8%	0.4%	4.6%	1.5%	4.7%	0.0%	15.2%	20.1%	7.1%	12.9%	0.0%	0.2%	0.0%	0.0%	0.3%	0.2%	0.0%	0.0%	3.6%	25.8%
1981	1545	2,3,4,5	2.4%	0.1%	0.4%	1.5%	0.8%	1.7%	0.3%	17.5%	32.9%	12.3%	14.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	4.0%	11.2%
1982	788	2,3,4,5	5.5%	0.8%	1.3%	4.7%	0.4%	4.6%	0.0%	12.6%	11.3%	6.1%	20.3%	0.0%	0.0%	0.0%	0.0%	1.1%	0.8%	0.0%	0.0%	1.6%	29.1%
1983	695	2,3,4,5	5.5%	0.3%	0.7%	5.0%	1.2%	1.2%	0.0%	14.5%	15.3%	7.1%	18.7%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	8.2%	21.4%
1984	559	2,3,4,5	2.0%	0.4%	0.0%	1.4%	6.4%	1.6%	0.0%	9.1%	39.4%	7.0%	9.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	18.4%
1985	816	2,3,4,5	6.5%	1.3%	0.0%	2.1%	2.1%	1.6%	0.0%	2.2%	24.5%	4.3%	18.4%	0.0%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	0.0%	8.9%	24.9%
1986	1349	2,3,4,5	3.0%	0.4%	0.0%	0.8%	2.9%	1.4%	0.0%	9.9%	29.9%	13.5%	14.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	17.9%
1987	803	2,3,4,5	10.2%	0.0%	1.0%	4.2%	2.9%	4.7%	0.0%	2.1%	22.8%	2.7%	7.5%	0.0%	0.9%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	6.6%	33.6%
1988	547	2,3,4,5	2.4%	1.8%	0.0%	2.2%	1.1%	2.7%	1.6%	1.6%	39.5%	1.1%	12.1%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	4.4%	28.2%
1989	627	2,3,4,5	4.5%	5.6%	0.8%	3.5%	1.8%	4.9%	0.0%	1.9%	22.5%	0.5%	7.8%	0.0%	0.3%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	17.9%	27.0%
1990	784	2,3,4,5	4.8%	4.7%	0.0%	6.6%	2.4%	3.1%	0.0%	3.7%	19.3%	1.7%	16.1%	0.0%	0.1%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	4.5%	30.5%
1991	788	2,3,4,5	2.8%	3.7%	0.0%	2.3%	1.9%	2.0%	0.0%	6.0%	33.2%	1.3%	7.2%	0.0%	0.5%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	10.7%	28.0%
1992	752	2,3,4,5	3.3%	5.5%	2.5%	5.5%	6.4%	3.2%	0.0%	9.8%	29.3%	5.6%	4.4%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	5.2%	19.0%
1993	520	2,3,4,5	1.5%	2.3%	0.0%	1.5%	2.5%	1.7%	0.0%	4.2%	42.9%	4.4%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	4.6%	24.8%
1994	282	2,3,4,5	5.0%	0.0%	0.0%	1.8%	1.8%	2.8%	0.0%	5.0%	26.6%	1.8%	5.7%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	6.4%	40.4%
1995	244	2,3,4,5	7.0%	0.0%	0.0%	2.0%	3.3%	0.0%	0.0%	0.0%	17.6%	0.0%	9.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	50.0%
1996	370	2,3,4,5	3.0%	0.0%	0.0%	0.5%	0.8%	0.3%	0.0%	0.0%	55.1%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	2.2%	36.2%
1997	230	2,3,4,5	4.8%	0.0%	0.0%	3.5%	2.2%	0.0%	4.3%	0.9%	10.9%	3.5%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	21.7%	45.2%
1998	204	2,3,4,5	7.4%	1.0%	0.0%	0.0%	6.9%	0.0%	0.0%	0.0%	14.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.3%	60.8%
1999	293	2,3,4,5	6.1%	2.4%	0.0%	3.8%	4.8%	0.0%	3.8%	0.0%	12.6%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	2.4%	59.7%
2000	250	2,3,4,5	16.8%	1.6%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	10.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%	4.0%	60.4%
2001	541	2,3,4,5	4.6%	13.3%	0.0%	0.0%	11.1%	0.6%	0.0%	0.0%	9.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	2.2%	56.7%
2002	338	2,3,4,5	11.2%	0.0%	3.3%	3.6%	6.5%	1.8%	3.3%	0.0%	6.8%	0.0%	5.0%	0.0%	0.0%	0.0%	0.9%	2.1%	0.0%	0.0%	0.0%	3.6%	52.1%
2003	278	2,3,4,5	8.6%	0.7%	2.2%	0.0%	14.7%	3.2%	0.0%	0.0%	12.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	58.3%
2004	394	2,3,4,5	8.6%	0.0%	0.3%	5.8%	3.8%	1.5%	0.0%	0.0%	8.1%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.8%	69.0%
2005	596	2,3,4,5	9.7%	0.5%	0.0%	2.0%	14.9%	5.2%	2.9%	0.0%	8.1%	0.0%	1.0%	0.0%	0.5%	0.0%	0.7%	3.5%	0.0%	0.0%	0.0%	1.5%	49.5%
2006	625	2,3,4,5	5.3%	4.2%	1.0%	1.6%	4.8%	0.6%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.2%	0.0%	0.0%	0.0%	3.7%	73.9%
2007	626	2,3,4,5	12.3%	0.5%	0.5%	5.3%	8.9%	0.6%	2.2%	0.0%	6.5%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	5.6%	55.1%
2008	437	2,3,4,5	5.3%	0.9%	0.5%	1.8%	7.6%	0.9%	6.9%	0.0%	9.2%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	2.1%	4.8%	0.0%	0.0%	2.5%	57.2%
2009	550	2,3,4,5	4.5%	5.6%	0.0%	2.0%	3.6%	1.6%	5.1%	0.0%	9.1%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.9%	0.9%	0.0%	0.0%	2.7%	63.3%
2010	473	2,3,4,5	7.0%	0.2%	1.5%	1.5%	8.7%	1.1%	3.6%	0.0%	13.1%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	59.6%
2011	532	2,3,4,5	7.5%	1.9%	2.1%	0.0%	7.7%	0.9%	1.1%	0.0%	10.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	1.1%	65.0%
2012	536	2,3,4,5	7.1%	2.4%	0.0%	3.4%	9.1%	1.1%	0.0%	0.0%	23.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	1.1%	50.7%
1979-2012	777		5.9%	1.9%	0.6%	2.5%	4.7%	1.9%	1.0%	4.0%	19.6%	2.8%	6.2%	0.0%	0.2%	0.0%	0.1%	0.9%	0.5%	0.0%	0.0%	5.1%	42.1%
1979-1984	1937		3.5%	0.7%	0.5%	3.2%	1.8%	2.7%	0.1%	15.0%	22.4%	8.3%	14.6%	0.0%	0.0%	0.0%	0.0%	0.3%	0.4%	0.0%	0.0%	4.2%	22.3%
1985-1995	683		4.6%	2.3%	0.4%	3.0%	2.6%	2.6%	0.1%	4.2%	28.0%	3.3%	10.2%	0.0%	0.2%	0.0%	0.0%	0.8%	0.4%	0.0%	0.0%	7.7%	29.5%
1996-1998	268		5.0%	0.3%	0.0%	1.3%	3.3%	0.1%	1.4%	0.3%	26.9%	1.2%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	11.1%	47.4%
1999-2012	462		8.2%	2.4%	0.8%	2.2%	7.8%	1.4%	2.1%	0.0%	10.3%	0.3%	0.6%	0.0%	0.2%	0.0%	0.1%	1.5%	0.5%	0.0%	0.0%	2.2%	59.3%

Appendix C4. Percent distribution of Chilkat River total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	63	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	310	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	512	3,4,5	4.3%	9.4%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.3%
2005	548	3,4,5,6	4.9%	5.3%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	88.3%
2006	309	3,4,5,6	3.2%	1.9%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.2%
2007	274	3,4,5,6	5.1%	10.6%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.3%
2008	442	3,4,5,6	5.2%	6.1%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	88.0%
2009	570	3,4,5,6	3.5%	1.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	94.6%
2010	300	3,4,5,6	5.0%	12.3%	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.3%
2011	341	3,4,5,6	5.6%	10.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.0%
1979-2011	412		4.6%	7.2%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	85.6%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1996-1998	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1999-2011	412		4.6%	7.2%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	85.6%

Appendix C5. Percent distribution of Chilliwack River Fall (Fraser Late) total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM																
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	3147	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	4632	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	2264	2,3,4	1.1%	0.1%	0.0%	0.4%	0.2%	33.9%	0.0%	6.3%	22.1%	2.3%	6.3%	0.0%	3.9%	0.0%	0.4%	4.8%	4.3%	0.0%	0.0%	1.1%	12.9%
1986	2155	2,3,4,5	0.0%	0.0%	0.0%	0.8%	0.2%	20.2%	0.0%	9.4%	18.4%	2.6%	12.9%	0.0%	2.7%	0.0%	0.2%	4.9%	7.6%	0.0%	0.0%	1.3%	18.7%
1987	2651	2,3,4,5	0.0%	0.0%	0.0%	0.8%	0.3%	19.0%	0.5%	16.0%	18.9%	0.5%	2.3%	0.0%	4.0%	0.0%	0.2%	3.6%	2.8%	0.0%	0.0%	1.2%	29.9%
1988	2389	2,3,4,5	0.4%	0.1%	0.0%	0.2%	0.0%	18.1%	0.0%	6.4%	13.1%	0.0%	2.3%	0.0%	4.2%	0.0%	0.1%	4.0%	2.8%	0.0%	0.0%	2.6%	45.6%
1989	1305	2,3,4,5	0.3%	0.0%	0.0%	0.0%	0.0%	23.3%	0.0%	1.8%	21.2%	0.0%	3.6%	0.0%	5.8%	0.0%	0.2%	3.6%	1.3%	0.0%	0.0%	0.6%	38.3%
1990	1803	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.3%	10.5%	2.0%	3.4%	17.1%	0.1%	4.8%	0.0%	6.1%	0.0%	0.5%	15.5%	7.5%	0.0%	0.0%	1.1%	30.1%
1991	3136	2,3,4,5	0.3%	0.1%	0.0%	0.4%	0.1%	19.1%	0.6%	9.0%	15.9%	0.2%	5.2%	0.0%	13.3%	0.0%	0.1%	5.8%	5.1%	0.0%	0.0%	1.5%	23.3%
1992	4172	2,3,4,5	0.3%	0.0%	0.0%	0.1%	0.1%	20.1%	0.1%	6.6%	10.8%	0.7%	1.6%	0.0%	8.7%	0.0%	0.1%	0.9%	3.5%	0.0%	0.0%	1.2%	45.1%
1993	1991	2,3,4,5	0.3%	0.0%	0.0%	0.0%	0.4%	13.3%	0.4%	8.1%	7.0%	0.0%	1.4%	0.0%	7.6%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	2.0%	58.4%
1994	740	2,3,4,5	0.4%	0.4%	0.0%	0.8%	0.0%	8.1%	2.6%	3.2%	7.7%	0.4%	7.3%	0.0%	1.5%	0.0%	0.0%	5.3%	5.9%	0.0%	0.0%	5.8%	50.5%
1995	2252	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.2%	12.5%	0.4%	0.0%	7.8%	0.0%	4.3%	0.0%	1.1%	0.0%	0.0%	1.4%	2.4%	0.0%	0.0%	1.0%	68.8%
1996	1799	2,3,4,5	0.2%	0.0%	0.0%	0.1%	0.0%	1.9%	0.3%	0.0%	23.0%	0.0%	2.7%	0.0%	3.9%	0.0%	0.0%	1.1%	4.3%	0.0%	0.0%	2.2%	60.3%
1997	2443	2,3,4,5	0.6%	0.0%	0.0%	0.1%	0.5%	12.6%	1.9%	0.0%	14.7%	0.3%	4.8%	0.0%	4.5%	0.0%	0.1%	2.5%	4.0%	0.0%	0.0%	2.5%	51.0%
1998	3189	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.3%	0.2%	0.3%	0.0%	4.0%	0.0%	0.5%	0.0%	3.1%	0.0%	0.0%	0.3%	0.9%	0.0%	0.0%	1.3%	88.6%
1999	3389	2,3,4,5	0.1%	0.0%	0.0%	0.2%	0.1%	0.3%	1.9%	0.0%	11.2%	0.0%	0.4%	0.0%	13.5%	0.0%	0.5%	0.7%	0.6%	0.0%	0.0%	1.6%	68.9%
2000	2719	2,3,4,5	0.1%	0.0%	0.0%	0.0%	0.5%	5.8%	2.7%	0.0%	5.1%	0.0%	0.0%	0.0%	4.4%	0.0%	0.1%	0.7%	1.0%	0.0%	0.0%	2.5%	76.9%
2001	4269	2,3,4,5	0.1%	0.1%	0.0%	0.0%	0.2%	3.7%	1.6%	0.0%	9.2%	0.0%	0.2%	0.0%	6.2%	0.0%	0.4%	1.1%	4.8%	0.0%	0.0%	12.9%	59.8%
2002	5155	2,3,4,5	0.3%	0.0%	0.0%	0.1%	0.3%	8.2%	4.8%	0.0%	4.2%	0.0%	0.7%	0.0%	8.1%	0.0%	1.1%	0.3%	2.1%	0.0%	0.0%	5.3%	64.4%
2003	4671	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.2%	5.7%	2.8%	0.0%	3.2%	0.0%	0.3%	0.0%	8.5%	0.0%	0.5%	0.3%	1.3%	0.0%	0.0%	6.4%	70.6%
2004	6773	2,3,4,5	0.2%	0.0%	0.0%	0.2%	0.0%	5.3%	2.3%	0.0%	0.8%	0.0%	0.7%	0.0%	6.8%	0.0%	0.2%	0.1%	1.1%	0.0%	0.0%	4.8%	77.5%
2005	4064	2,3,4,5	0.0%	0.0%	0.0%	0.1%	0.2%	7.5%	4.2%	0.0%	3.7%	0.0%	3.6%	0.0%	3.8%	0.0%	0.9%	0.9%	1.0%	0.0%	0.0%	6.0%	68.1%
2006	3014	2,3,4,5	0.0%	0.0%	0.0%	0.5%	0.0%	7.4%	2.2%	0.0%	2.4%	0.0%	0.6%	0.0%	2.8%	0.0%	0.3%	0.3%	1.7%	0.0%	0.0%	4.5%	77.3%
2007	1821	2,3,4,5	0.0%	0.0%	0.0%	0.3%	0.0%	8.4%	3.2%	0.0%	2.3%	0.0%	3.0%	0.0%	2.6%	0.0%	0.2%	0.7%	1.8%	0.0%	0.2%	6.7%	70.6%
2008	2849	2,3,4,5	0.3%	0.0%	0.0%	0.0%	0.0%	11.0%	4.9%	0.0%	2.1%	0.0%	1.1%	0.0%	4.7%	0.0%	1.7%	0.9%	1.9%	0.0%	0.0%	9.8%	61.6%
2009	3017	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	3.2%	0.0%	4.6%	0.0%	3.8%	0.0%	0.7%	0.0%	0.3%	1.3%	3.7%	0.0%	0.0%	14.0%	66.7%
2010	5381	2,3,4,5	0.3%	0.0%	0.0%	0.1%	0.0%	3.1%	3.1%	0.0%	7.9%	0.0%	1.9%	0.0%	4.2%	0.0%	1.1%	1.0%	1.8%	0.0%	0.0%	7.1%	68.4%
2011	4963	2,3,4,5	0.0%	0.0%	0.0%	0.1%	0.2%	4.4%	3.4%	0.0%	4.0%	0.0%	1.9%	0.0%	1.6%	0.0%	0.6%	1.3%	3.2%	0.0%	0.0%	3.5%	75.8%
2012	5185	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	1.9%	0.0%	10.4%	0.0%	0.2%	0.0%	8.5%	0.0%	0.8%	0.5%	3.8%	0.0%	0.3%	4.1%	68.3%
1979-2012	3199		0.2%	0.0%	0.0%	0.2%	0.2%	10.2%	1.8%	2.5%	9.7%	0.3%	2.8%	0.0%	5.2%	0.0%	0.4%	2.3%	3.0%	0.0%	0.0%	4.1%	57.0%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	2260		0.4%	0.1%	0.0%	0.3%	0.2%	18.0%	0.6%	6.4%	14.5%	0.6%	4.7%	0.0%	5.3%	0.0%	0.2%	4.5%	4.0%	0.0%	0.0%	1.8%	38.3%
1996-1998	2477		0.4%	0.0%	0.0%	0.1%	0.3%	4.9%	0.8%	0.0%	13.9%	0.1%	2.7%	0.0%	3.9%	0.0%	0.0%	1.3%	3.0%	0.0%	0.0%	2.0%	66.6%
1999-2012	4091		0.1%	0.0%	0.0%	0.1%	0.1%	5.2%	3.0%	0.0%	5.1%	0.0%	1.3%	0.0%	5.4%	0.0%	0.6%	0.7%	2.1%	0.0%	0.0%	6.4%	69.6%

Appendix C6. Percent distribution of Cowichan River Fall (Lower Strait of Georgia Natural) total fishing mortalities among fisheries and escapement.

Catch	Estimated		AABM							ISBM															
	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	123	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	308	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	626	2,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	2072	2,3,5	0.0%	0.0%	0.0%	0.1%	0.5%	2.2%	0.0%	13.0%	54.9%	1.1%	10.1%	0.0%	0.6%	0.0%	0.2%	3.5%	1.9%	0.0%	0.4%	1.3%	10.2%
1991	4234	2,3,4	0.1%	0.0%	0.0%	0.2%	1.2%	3.9%	0.7%	9.0%	59.7%	0.4%	4.2%	0.0%	0.7%	0.0%	0.0%	3.3%	0.9%	0.0%	0.4%	0.7%	14.6%
1992	4588	2,3,4,5	0.1%	0.1%	0.0%	0.4%	0.7%	8.7%	1.1%	17.9%	51.9%	1.0%	4.1%	0.0%	0.2%	0.0%	0.0%	1.3%	1.3%	0.0%	0.7%	0.5%	10.2%
1993	4138	2,3,4,5	0.3%	0.0%	0.0%	0.1%	1.1%	7.9%	1.4%	11.9%	52.6%	0.5%	3.3%	0.0%	0.6%	0.0%	0.0%	0.9%	0.5%	0.0%	1.0%	0.7%	17.3%
1994	1342	2,3,4,5	0.5%	0.0%	0.0%	0.4%	0.0%	3.9%	0.7%	4.8%	41.3%	0.1%	7.7%	0.0%	0.4%	0.0%	0.0%	4.1%	0.7%	0.0%	3.7%	2.3%	29.3%
1995	1674	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.0%	5.4%	0.6%	0.0%	37.4%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	2.4%	1.1%	0.0%	1.5%	4.4%	44.1%
1996	1356	2,3,4,5	0.3%	0.0%	0.0%	0.0%	0.0%	0.4%	1.0%	0.0%	50.1%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	1.0%	4.8%	0.0%	4.7%	2.6%	34.4%
1997	937	2,3,4,5	1.1%	0.0%	0.0%	0.0%	0.5%	3.3%	0.9%	0.0%	25.9%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	3.4%	3.4%	0.0%	0.3%	2.9%	57.1%
1998	471	2,3,4,5	3.8%	0.0%	0.0%	0.0%	0.8%	0.4%	1.7%	0.0%	26.1%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	8.7%	8.9%	45.4%
1999	578	2,3,4,5	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	3.5%	0.0%	46.2%	0.0%	0.0%	0.0%	0.9%	0.0%	0.5%	7.6%	0.0%	0.0%	2.2%	5.5%	32.4%
2000	801	2,3,4,5	0.7%	0.4%	0.0%	0.0%	0.0%	1.2%	4.7%	0.0%	18.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	2.2%	0.0%	0.5%	7.5%	58.8%
2001	784	2,3,4,5	0.4%	0.0%	0.0%	0.0%	0.1%	9.6%	0.0%	0.0%	32.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	12.8%	2.9%	0.0%	6.6%	2.4%	32.9%
2002	739	2,3,4,5	1.5%	0.0%	0.0%	0.0%	2.4%	3.4%	3.1%	0.0%	21.7%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	4.2%	6.0%	0.0%	12.4%	14.7%	29.9%
2003	396	2,3,4,5	2.3%	0.3%	0.0%	2.5%	3.3%	9.1%	3.0%	0.0%	34.3%	0.5%	0.0%	0.0%	0.5%	0.0%	0.0%	8.1%	3.8%	0.0%	4.5%	4.0%	23.7%
2004	386	2,3,4,5	0.0%	0.5%	0.0%	0.8%	4.9%	15.5%	11.7%	0.0%	23.6%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	6.7%	2.3%	0.0%	3.9%	3.6%	23.8%
2005	347	2,3,4,5	0.0%	0.3%	0.0%	1.4%	5.5%	23.9%	2.0%	0.0%	10.1%	0.0%	1.4%	0.0%	0.3%	0.0%	0.9%	18.7%	1.7%	0.0%	7.8%	0.0%	25.9%
2006	279	3,4,5	1.1%	0.0%	0.0%	0.7%	0.0%	21.9%	11.8%	0.0%	15.8%	0.0%	0.0%	0.0%	2.5%	0.0%	0.7%	5.4%	5.4%	0.0%	6.8%	0.0%	28.0%
2007	292	2,4,5	0.0%	0.0%	0.7%	0.0%	0.0%	7.9%	2.4%	0.0%	18.5%	0.0%	1.4%	0.0%	0.3%	0.0%	0.7%	8.6%	0.0%	0.0%	5.8%	0.0%	53.8%
2008	284	2,3,5	0.0%	0.0%	0.4%	0.0%	0.4%	11.6%	12.0%	0.0%	35.6%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	5.3%	1.1%	0.0%	5.6%	0.0%	27.1%
2009	626	2,3,4	0.0%	0.0%	0.5%	0.0%	0.3%	5.6%	7.8%	0.0%	50.2%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	6.5%	5.4%	0.0%	5.3%	0.0%	17.7%
2010	1302	2,3,4,5	0.2%	0.1%	0.0%	0.0%	2.2%	7.8%	2.3%	0.0%	38.9%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	6.7%	4.0%	0.0%	1.8%	0.0%	35.0%
2011	1948	2,3,4,5	0.6%	0.2%	0.0%	0.2%	2.1%	4.8%	4.8%	0.0%	21.1%	0.0%	0.0%	0.0%	1.2%	0.0%	0.2%	3.8%	5.5%	0.0%	3.1%	0.2%	52.3%
2012	3352	2,3,4,5	0.6%	0.1%	0.1%	0.5%	1.0%	3.2%	3.4%	0.0%	20.9%	0.0%	0.2%	0.0%	0.4%	0.0%	0.3%	3.6%	1.0%	0.0%	27.2%	0.2%	37.2%
1979-2012	1432		0.6%	0.1%	0.1%	0.3%	1.2%	7.0%	3.5%	2.5%	34.2%	0.2%	1.6%	0.0%	0.6%	0.0%	0.2%	5.5%	2.4%	0.0%	5.0%	2.7%	32.2%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	3008		0.2%	0.0%	0.0%	0.2%	0.6%	5.3%	0.8%	9.4%	49.6%	0.5%	5.4%	0.0%	0.4%	0.0%	0.0%	2.6%	1.0%	0.0%	1.3%	1.6%	21.0%
1996-1998	921		1.7%	0.0%	0.0%	0.0%	0.5%	1.4%	1.2%	0.0%	34.1%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	2.7%	2.7%	0.0%	4.6%	4.8%	45.7%
1999-2012	865		0.5%	0.1%	0.1%	0.4%	1.7%	9.0%	5.2%	0.0%	27.7%	0.0%	0.2%	0.0%	0.9%	0.0%	0.2%	7.4%	3.0%	0.0%	6.7%	2.7%	34.2%

Appendix C7. Percent distribution of Cowlitz Fall Tule (Fall Cowlitz Hatchery) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	28	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	282	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	417	2,3,4	6.0%	0.0%	0.0%	2.4%	6.2%	17.3%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	12.7%	0.0%	12.7%	0.5%	0.0%	0.0%	13.9%	0.0%	24.9%
1982	505	2,3,4,5	4.2%	0.0%	0.4%	1.6%	0.0%	16.4%	1.0%	0.0%	0.0%	0.4%	3.4%	0.0%	20.2%	0.0%	10.9%	2.8%	0.0%	0.0%	7.3%	1.6%	29.9%
1983	616	2,3,4,5	4.4%	0.0%	0.0%	7.1%	0.0%	18.8%	0.0%	0.0%	0.3%	3.9%	1.0%	0.0%	7.8%	0.0%	17.7%	0.5%	0.0%	0.0%	4.4%	1.0%	33.1%
1984	794	2,3,4,5	5.2%	0.0%	0.0%	7.4%	0.9%	25.2%	0.0%	0.0%	0.0%	2.3%	1.9%	0.0%	4.8%	0.0%	0.1%	0.1%	0.0%	0.0%	14.9%	3.4%	33.9%
1985	742	2,3,4,5	3.9%	0.9%	0.0%	4.4%	0.0%	12.7%	0.0%	0.0%	0.4%	0.0%	5.7%	0.0%	5.1%	0.0%	5.7%	0.5%	0.7%	0.0%	6.7%	7.7%	45.6%
1986	1552	2,3,4,5	0.5%	0.2%	0.0%	0.2%	0.0%	13.9%	0.0%	0.0%	0.3%	0.7%	1.8%	0.0%	14.4%	0.0%	5.5%	0.3%	0.5%	0.0%	30.9%	6.3%	24.5%
1987	1481	2,3,4,5	5.7%	0.6%	0.0%	4.6%	0.0%	11.3%	0.9%	0.0%	0.0%	1.4%	0.7%	0.0%	12.2%	0.0%	7.1%	0.1%	0.5%	0.0%	21.5%	7.7%	25.7%
1988	1555	2,3,4,5	1.8%	0.6%	0.0%	2.1%	0.0%	17.9%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	15.9%	0.0%	2.0%	0.0%	0.0%	0.0%	23.1%	10.2%	25.8%
1989	611	2,3,4,5	4.3%	0.0%	0.7%	4.7%	0.0%	7.2%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	18.8%	0.0%	3.3%	0.0%	0.3%	0.0%	6.9%	7.0%	45.5%
1990	297	2,3,4,5	4.4%	0.0%	0.0%	2.4%	0.0%	15.5%	0.0%	0.0%	0.0%	3.4%	3.7%	0.0%	10.1%	0.0%	7.7%	0.0%	4.0%	0.0%	0.0%	1.0%	47.8%
1991	151	2,3,4,5	11.3%	8.6%	0.0%	3.3%	0.0%	6.0%	3.3%	0.0%	0.0%	1.3%	0.0%	0.0%	10.6%	0.0%	3.3%	0.0%	0.0%	0.0%	9.9%	5.3%	37.1%
1992	203	2,3,4,5	2.5%	0.0%	0.0%	0.0%	1.5%	20.2%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	7.9%	2.5%	5.4%	0.0%	0.0%	0.0%	3.4%	0.0%	54.2%
1993	362	2,3,4,5	4.1%	0.0%	0.0%	3.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	19.1%	0.0%	7.5%	0.0%	0.0%	0.0%	3.3%	15.2%	39.0%
1994	217	2,3,4,5	5.1%	0.0%	0.0%	2.3%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	87.1%
1995	174	2,3,4,5	1.7%	0.0%	0.0%	2.9%	0.0%	2.3%	2.3%	0.0%	0.0%	0.0%	1.1%	0.0%	4.6%	0.0%	0.0%	1.1%	0.0%	0.0%	1.1%	1.7%	81.0%
1996	279	2,3,4,5	5.4%	0.0%	0.0%	0.4%	0.0%	0.7%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	3.6%	80.3%
1997	173	2,3,4,5	6.4%	0.0%	11.0%	2.3%	0.0%	6.4%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	64.7%
1998	80	2,3,4,5	5.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	77.5%
1999	150	2,3,4,5	6.7%	0.0%	4.0%	0.0%	6.7%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.3%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	14.0%	52.0%
2000	110	2,3,4,5	3.6%	0.0%	0.0%	0.0%	0.0%	8.2%	13.6%	0.0%	0.0%	0.0%	0.0%	0.0%	16.4%	0.0%	1.8%	0.0%	0.0%	0.0%	5.5%	5.5%	45.5%
2001	481	2,3,4,5	1.0%	0.0%	0.0%	0.0%	0.0%	1.2%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	12.1%	0.0%	10.2%	0.0%	0.0%	0.0%	1.7%	2.5%	67.6%
2002	573	2,3,4,5	7.0%	0.0%	0.0%	1.0%	0.0%	6.6%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	27.7%	0.0%	21.6%	0.0%	0.0%	0.0%	3.3%	3.8%	25.5%
2003	543	2,3,4,5	5.3%	0.0%	0.0%	1.5%	0.0%	9.6%	2.2%	0.0%	1.5%	0.0%	0.0%	0.0%	18.4%	0.0%	7.0%	0.0%	0.0%	0.0%	8.7%	5.2%	40.7%
2004	221	2,3,4,5	5.4%	0.0%	0.0%	0.9%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	19.5%	0.0%	9.5%	0.0%	2.3%	0.0%	9.0%	2.3%	45.2%
2005	239	2,3,4,5	2.9%	7.9%	0.0%	2.9%	0.0%	4.2%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	8.4%	0.0%	5.4%	0.0%	0.0%	0.0%	3.3%	4.2%	57.3%
2006	141	2,3,4,5	5.7%	0.0%	0.0%	2.8%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	2.1%	0.0%	0.0%	0.0%	2.1%	12.1%	63.1%
2007	154	2,3,4,5	2.6%	3.9%	0.0%	5.2%	0.0%	9.7%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	17.5%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	52.6%
2008	201	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	9.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	6.0%	0.0%	2.5%	0.0%	3.0%	10.9%	66.2%
2009	483	2,3,4,5	2.7%	0.0%	2.3%	0.0%	1.7%	1.4%	1.4%	0.0%	4.3%	0.0%	0.0%	0.0%	6.0%	0.0%	3.7%	0.0%	3.1%	0.0%	1.7%	7.7%	64.0%
2010	634	2,3,4,5	3.5%	0.5%	0.0%	1.3%	0.3%	3.2%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	11.5%	0.0%	10.6%	0.0%	0.0%	0.0%	1.9%	1.4%	64.5%
2011	1380	2,3,4,5	1.2%	0.1%	0.1%	0.4%	0.8%	1.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	2.6%	0.0%	0.0%	0.0%	0.4%	0.9%	90.4%
1979-2011	501		4.2%	0.8%	0.6%	2.3%	0.6%	8.7%	1.3%	0.0%	0.4%	0.5%	0.8%	0.0%	11.2%	0.1%	5.8%	0.2%	0.5%	0.0%	6.1%	4.6%	51.4%
1979-1984	583		4.9%	0.0%	0.1%	4.6%	1.8%	19.4%	0.2%	0.0%	0.1%	1.6%	2.4%	0.0%	11.4%	0.0%	10.4%	1.0%	0.0%	0.0%	10.1%	1.5%	30.5%
1985-1995	668		4.1%	1.0%	0.1%	2.7%	0.1%	10.6%	0.6%	0.0%	0.1%	0.8%	1.5%	0.0%	11.1%	0.2%	4.3%	0.2%	0.6%	0.0%	9.7%	5.6%	46.7%
1996-1998	177		5.6%	0.0%	3.7%	2.6%	0.0%	2.4%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	7.1%	0.0%	0.8%	0.0%	0.0%	0.0%	0.4%	1.6%	74.2%
1999-2011	408		3.7%	1.0%	0.5%	1.2%	0.7%	5.3%	2.6%	0.0%	0.4%	0.0%	0.0%	0.0%	12.2%	0.0%	6.8%	0.0%	0.6%	0.0%	3.1%	5.4%	56.5%

Appendix C8. Percent distribution of Dome Creek Spring (Fraser Early) total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	1	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	41	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	153	3,4,5	0.0%	0.0%	0.0%	0.0%	3.3%	0.7%	0.0%	0.7%	7.2%	0.0%	5.2%	0.0%	2.0%	0.0%	0.0%	0.0%	13.7%	0.0%	0.0%	3.3%	64.1%
1992	164	3,4,5,6	0.0%	0.0%	0.0%	0.0%	2.4%	4.3%	0.0%	3.7%	7.3%	0.0%	44.5%	0.0%	1.2%	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	0.0%	30.5%
1993	361	3,4,5,6	0.0%	0.0%	0.0%	0.0%	2.8%	1.7%	0.0%	0.0%	6.6%	0.0%	48.8%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	33.0%
1994	304	3,4,5,6	1.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	1.6%	0.0%	27.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	65.8%
1995	535	3,4,5,6	0.0%	0.0%	0.0%	0.7%	0.0%	1.7%	0.0%	0.0%	6.9%	0.0%	20.7%	0.0%	0.4%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	3.0%	65.0%
1996	374	3,4,5,6	0.0%	0.0%	0.0%	0.5%	1.1%	0.0%	0.0%	0.0%	8.0%	0.0%	36.9%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	4.3%	47.1%
1997	327	3,4,5,6	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.3%	0.0%	7.6%	0.0%	38.8%	0.0%	1.2%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	49.8%
1998	247	3,4,5,6	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	44.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.9%	41.3%
1999	63	3,4,5,6	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.8%	0.0%	30.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	36.5%
2000	119	3,4,5,6	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.5%	0.0%	41.2%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.8%
2001	326	3,4,5,6	0.0%	0.0%	0.0%	0.0%	0.9%	1.8%	0.0%	0.0%	17.5%	0.0%	56.7%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	19.9%
2002	151	4,5,6	0.0%	0.0%	0.0%	11.3%	0.0%	9.9%	0.0%	0.0%	11.9%	0.0%	19.2%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	44.4%
2003	152	3,5,6	0.0%	0.0%	0.0%	5.3%	0.0%	0.0%	7.2%	0.0%	12.5%	0.0%	59.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.1%
2004	12	3,4,6	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	214	3,4,5	0.0%	0.0%	0.0%	4.2%	0.0%	0.5%	0.0%	0.0%	4.7%	0.0%	56.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	7.5%	26.2%
2006	110	4,5,6	0.0%	0.0%	0.0%	0.0%	0.0%	7.3%	0.0%	0.0%	5.5%	0.0%	43.6%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	42.7%
2007	20	5,6	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2009	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2010	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979-2012	240		0.1%	0.0%	0.0%	1.5%	0.7%	2.0%	0.5%	0.3%	10.2%	0.0%	38.2%	0.0%	0.9%	0.0%	0.0%	0.1%	1.6%	0.0%	0.0%	3.0%	40.9%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	303		0.2%	0.0%	0.0%	0.1%	1.7%	2.0%	0.0%	0.9%	5.9%	0.0%	29.2%	0.0%	1.0%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	2.9%	51.7%
1996-1998	316		0.0%	0.0%	0.0%	0.2%	0.4%	0.3%	0.1%	0.0%	7.8%	0.0%	40.0%	0.0%	0.4%	0.0%	0.0%	0.4%	0.7%	0.0%	0.0%	3.7%	46.1%
1999-2012	162		0.0%	0.0%	0.0%	3.0%	0.1%	2.8%	1.0%	0.0%	14.2%	0.0%	43.8%	0.0%	1.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	2.8%	31.1%

Appendix C9. Percent distribution of Elk River (Oregon Coast) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM															Esc.
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	
1979	30	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	270	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	1193	2,3,4	2.4%	0.1%	0.2%	3.2%	0.0%	4.0%	0.0%	0.0%	0.0%	0.6%	1.3%	0.0%	12.4%	0.0%	0.4%	0.3%	0.0%	0.0%	0.0%	66.9%	8.3%
1982	3181	2,3,4,5	1.0%	0.4%	0.2%	1.7%	0.0%	4.7%	0.0%	0.0%	0.0%	0.3%	0.6%	0.0%	16.9%	0.0%	0.8%	0.4%	0.0%	0.0%	0.0%	54.6%	18.3%
1983	3010	2,3,4,5	3.5%	0.1%	0.0%	6.4%	0.0%	7.6%	0.1%	0.0%	0.0%	1.4%	0.0%	0.0%	12.2%	0.0%	0.4%	0.0%	0.3%	0.0%	0.0%	27.3%	40.6%
1984	2360	2,3,4,5	3.1%	0.0%	0.0%	4.2%	0.1%	5.5%	0.0%	0.0%	0.0%	0.6%	0.2%	0.0%	8.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.1%	57.6%
1985	1990	2,3,4,5	1.8%	0.0%	0.0%	2.2%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	5.6%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	32.1%	55.5%
1986	1068	2,3,4,5	1.9%	0.0%	0.0%	2.8%	0.0%	12.2%	0.5%	0.0%	0.5%	2.2%	0.0%	0.0%	34.9%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	13.4%	30.9%
1987	2140	2,3,4,5	0.8%	0.0%	0.0%	3.8%	0.0%	6.0%	0.7%	0.0%	0.0%	0.8%	0.0%	0.0%	24.9%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	23.6%	38.3%
1988	2231	2,3,4,5	0.5%	0.0%	0.0%	2.9%	0.0%	3.8%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	18.8%	0.0%	0.5%	0.0%	0.2%	0.0%	0.0%	35.5%	37.4%
1989	1390	2,3,4,5	0.7%	0.0%	0.3%	1.3%	0.4%	1.9%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	28.6%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	31.4%	34.7%
1990	561	2,3,4,5	1.1%	0.0%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	17.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	37.8%	40.5%
1991	482	2,3,4,5	0.0%	1.0%	0.0%	2.5%	0.0%	6.2%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	27.8%	55.4%
1992	726	2,3,4,5	3.2%	4.4%	0.0%	0.0%	0.0%	8.0%	0.8%	0.0%	0.0%	0.0%	0.3%	0.0%	13.2%	0.0%	0.4%	1.2%	0.0%	0.0%	0.0%	33.6%	34.8%
1993	1035	2,3,4,5	2.9%	0.0%	0.0%	2.6%	0.3%	6.1%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.6%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	21.9%	40.4%
1994	1703	2,3,4,5	3.7%	0.8%	0.0%	1.9%	0.5%	2.8%	0.0%	0.0%	0.0%	0.2%	0.6%	0.0%	17.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	34.8%	37.3%
1995	3473	2,3,4,5	2.4%	0.7%	0.6%	1.2%	0.2%	2.2%	0.3%	0.0%	0.0%	0.0%	0.9%	0.0%	13.6%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	32.8%	45.0%
1996	5120	2,3,4,5	2.2%	0.0%	0.0%	1.8%	0.2%	0.5%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	29.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	12.0%	53.6%
1997	4216	2,3,4,5	15.5%	0.0%	0.1%	1.9%	0.4%	1.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	19.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.5%	42.7%
1998	6110	2,3,4,5	8.5%	0.0%	0.0%	3.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.9%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	9.7%	65.2%
1999	6412	2,3,4,5	7.7%	0.0%	0.4%	2.4%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	17.7%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	15.9%	55.2%
2000	5379	2,3,4,5	7.9%	0.1%	0.1%	1.7%	0.6%	0.7%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	26.4%	0.0%	0.7%	0.1%	0.0%	0.0%	0.0%	13.9%	47.7%
2001	17231	2,3,4,5	3.2%	0.0%	0.2%	1.5%	0.0%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	11.9%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	12.8%	68.7%
2002	11294	2,3,4,5	6.0%	0.0%	0.6%	4.2%	0.8%	0.9%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	12.8%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	6.5%	66.8%
2003	6495	2,3,4,5	6.3%	0.0%	0.3%	3.7%	0.5%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	19.5%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	18.5%	50.1%
2004	11182	2,3,4,5	4.3%	0.0%	0.2%	2.0%	0.4%	1.9%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	13.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	6.3%	71.5%
2005	3078	2,3,4,5	10.0%	0.0%	0.2%	5.3%	1.9%	4.2%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	17.4%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	12.1%	47.2%
2006	2977	2,3,4,5	6.8%	0.0%	0.0%	5.0%	1.9%	5.2%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	23.3%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	11.1%	44.4%
2007	2375	2,3,4,5	10.1%	0.1%	0.7%	4.9%	1.0%	1.6%	0.5%	0.0%	0.4%	0.0%	0.0%	0.0%	29.4%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	17.9%	32.0%
2008	4160	2,3,4,5	4.9%	0.0%	0.0%	3.9%	1.9%	1.6%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	19.9%	61.7%
2009	3331	2,3,4,5	7.0%	0.0%	0.2%	4.6%	0.8%	1.7%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.3%	0.0%	0.1%	0.0%	0.0%	16.2%	65.9%
2010	4290	2,3,4,5	5.5%	0.0%	0.4%	4.3%	0.2%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	10.1%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	10.5%	67.7%
2011	2089	2,3,4,5	7.0%	0.0%	0.5%	4.3%	0.4%	2.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	30.0%	0.0%	0.5%	0.0%	0.2%	0.0%	0.0%	18.1%	35.9%
1979-2011	3945		4.6%	0.2%	0.2%	3.0%	0.4%	3.2%	0.3%	0.0%	0.0%	0.2%	0.2%	0.0%	17.3%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	23.0%	46.8%
1979-1984	2436		2.5%	0.1%	0.1%	3.9%	0.0%	5.5%	0.0%	0.0%	0.0%	0.7%	0.5%	0.0%	12.5%	0.0%	0.4%	0.2%	0.1%	0.0%	0.0%	42.2%	31.2%
1985-1995	1527		1.7%	0.6%	0.1%	1.9%	0.1%	4.8%	0.3%	0.0%	0.0%	0.4%	0.3%	0.0%	18.6%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	29.5%	40.9%
1996-1998	5149		8.7%	0.0%	0.0%	2.4%	0.3%	0.6%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	20.4%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	13.4%	53.8%
1999-2011	6176		6.7%	0.0%	0.3%	3.7%	0.8%	1.6%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	16.8%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	13.8%	55.0%

Appendix C10. Percent distribution of Elwha River total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	71	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	272	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	727	2,3,4	24.2%	3.0%	0.0%	2.6%	0.7%	17.6%	1.1%	0.8%	6.1%	1.0%	5.9%	0.0%	1.1%	0.0%	0.0%	11.0%	14.7%	0.0%	0.1%	0.0%	10.0%
1987	475	2,3,4,5	16.2%	0.0%	0.0%	5.1%	2.1%	15.8%	2.3%	0.8%	8.2%	2.5%	5.1%	0.0%	2.9%	0.2%	0.0%	5.5%	19.8%	0.0%	0.0%	0.0%	13.5%
1988	465	2,3,4,5	5.8%	0.9%	0.6%	3.9%	2.4%	15.5%	6.0%	0.4%	0.0%	1.5%	1.3%	0.0%	4.5%	0.0%	0.0%	7.7%	8.8%	0.0%	3.7%	0.0%	37.0%
1989	302	3,4,5	6.3%	6.3%	0.0%	4.6%	2.0%	5.6%	0.0%	0.0%	0.0%	3.0%	0.0%	0.0%	2.6%	0.0%	0.3%	8.6%	13.9%	0.0%	2.0%	0.0%	44.7%
1990	40	2,4,5	0.0%	0.0%	0.0%	12.5%	0.0%	15.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	12.5%	0.0%	5.0%	0.0%	50.0%
1991	26	2,3,5	3.8%	0.0%	0.0%	0.0%	0.0%	15.4%	0.0%	0.0%	3.8%	0.0%	3.8%	0.0%	7.7%	0.0%	0.0%	53.8%	11.5%	0.0%	0.0%	0.0%	0.0%
1992	75	2,3,4	2.7%	0.0%	0.0%	1.3%	0.0%	33.3%	4.0%	1.3%	4.0%	0.0%	8.0%	0.0%	12.0%	0.0%	0.0%	0.0%	30.7%	0.0%	0.0%	0.0%	2.7%
1993	157	2,3,4,5	12.1%	0.0%	0.0%	0.0%	0.0%	15.3%	10.2%	2.5%	11.5%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	28.7%	0.0%	2.5%	0.0%	14.6%
1994	87	2,3,4,5	8.0%	0.0%	0.0%	9.2%	0.0%	18.4%	0.0%	4.6%	3.4%	0.0%	8.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	48.3%
1995	153	2,3,4,5	0.0%	0.0%	0.0%	0.0%	2.6%	32.7%	2.6%	0.0%	0.0%	3.9%	6.5%	0.0%	1.3%	0.0%	0.0%	0.7%	13.7%	0.0%	0.0%	0.0%	35.9%
1996	313	2,3,4,5	4.2%	0.0%	0.0%	1.3%	0.0%	1.6%	3.2%	0.0%	3.8%	0.0%	2.9%	0.0%	0.6%	0.0%	0.0%	0.0%	7.3%	0.0%	0.0%	0.0%	75.1%
1997	194	3,4,5	14.9%	0.0%	0.5%	1.0%	0.0%	4.1%	0.0%	0.0%	6.7%	0.0%	4.1%	0.0%	1.0%	0.0%	0.0%	0.0%	13.9%	0.0%	0.0%	0.0%	53.6%
1998	172	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	27	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2009	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2010	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979-2011	251		8.2%	0.8%	0.1%	3.5%	0.8%	15.9%	2.5%	0.9%	4.0%	1.0%	3.8%	0.0%	3.0%	0.0%	0.0%	7.7%	14.6%	0.0%	1.1%	0.0%	32.1%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	251		7.9%	1.0%	0.1%	3.9%	1.0%	18.5%	2.6%	1.1%	3.7%	1.2%	3.9%	0.0%	3.5%	0.0%	0.0%	9.2%	15.4%	0.0%	1.3%	0.0%	25.7%
1996-1998	254		9.6%	0.0%	0.3%	1.2%	0.0%	2.9%	1.6%	0.0%	5.3%	0.0%	3.5%	0.0%	0.8%	0.0%	0.0%	0.0%	10.6%	0.0%	0.0%	0.0%	64.3%
1999-2011	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Appendix C11. Percent distribution of George Adams Fall Fingerling total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	70	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	405	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	710	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	855	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	20.8%	0.0%	0.2%	4.1%	0.6%	0.8%	0.0%	2.9%	0.0%	0.5%	29.4%	12.5%	0.0%	7.8%	0.0%	20.4%
1983	932	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	12.2%	0.3%	0.0%	2.6%	1.2%	4.1%	0.0%	0.1%	0.0%	0.5%	19.3%	41.3%	0.0%	7.7%	0.0%	10.6%
1984	1071	3,4,5	0.0%	0.1%	0.0%	0.6%	0.5%	18.0%	0.0%	1.2%	4.4%	3.2%	1.8%	0.0%	2.3%	0.0%	0.4%	12.8%	22.4%	0.0%	17.8%	0.0%	14.6%
1985	363	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	18	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	243	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	940	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	2012	2,3,4	0.0%	0.5%	0.0%	0.0%	0.0%	10.0%	1.7%	0.0%	4.4%	0.0%	4.2%	0.0%	12.7%	0.2%	0.8%	17.3%	17.4%	0.0%	19.2%	1.4%	10.0%
1990	1552	2,3,4,5	0.7%	0.0%	0.0%	0.4%	0.0%	21.1%	4.6%	0.0%	5.0%	0.4%	1.5%	0.0%	15.3%	0.0%	0.4%	10.5%	18.2%	0.0%	15.7%	0.3%	5.9%
1991	1050	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.0%	19.4%	4.5%	0.0%	2.4%	0.0%	0.3%	0.0%	8.6%	0.0%	0.0%	18.1%	18.4%	0.0%	13.9%	0.9%	13.4%
1992	187	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	17.1%	0.0%	0.0%	1.6%	0.0%	5.9%	0.0%	19.8%	0.0%	0.0%	2.7%	38.5%	0.0%	7.0%	0.0%	7.5%
1993	125	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	31.2%	8.0%	1.6%	4.0%	0.0%	0.0%	0.0%	8.8%	0.0%	0.0%	4.8%	24.8%	0.0%	0.0%	0.0%	16.8%
1994	49	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.3%	12.2%	0.0%	0.0%	0.0%	63.3%
1995	269	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	9.3%	3.7%	0.0%	6.3%	0.0%	3.3%	0.0%	0.7%	0.0%	0.0%	4.1%	27.9%	0.0%	0.0%	0.0%	44.6%
1996	373	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	4.6%	0.0%	14.7%	0.0%	2.4%	0.0%	5.6%	0.0%	0.5%	0.0%	15.5%	0.0%	0.0%	0.0%	55.2%
1997	399	2,3,4,5	2.3%	0.0%	0.0%	0.0%	0.0%	4.8%	1.3%	0.0%	3.3%	0.0%	0.8%	0.0%	2.8%	0.0%	0.0%	0.8%	24.1%	0.0%	0.0%	0.0%	60.2%
1998	595	2,3,4,5	0.7%	0.2%	0.0%	0.0%	0.0%	0.2%	1.2%	0.0%	2.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	2.0%	27.4%	0.0%	0.0%	0.0%	64.9%
1999	899	2,3,4,5	0.6%	0.0%	0.0%	0.0%	0.0%	0.9%	9.1%	0.0%	3.2%	0.0%	0.0%	0.0%	5.8%	0.0%	1.4%	2.2%	12.8%	0.0%	0.6%	0.0%	63.4%
2000	965	2,3,4,5	0.4%	0.0%	0.0%	0.4%	0.0%	20.2%	8.6%	0.0%	3.5%	0.0%	0.2%	0.0%	3.5%	0.0%	0.0%	0.3%	11.5%	0.0%	0.0%	12.3%	39.0%
2001	907	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.1%	12.2%	2.1%	0.0%	3.0%	0.0%	0.0%	0.0%	6.7%	0.0%	1.0%	5.4%	15.5%	0.0%	5.2%	0.6%	47.3%
2002	1051	2,3,4,5	1.7%	0.0%	0.0%	1.1%	0.0%	10.2%	11.0%	0.0%	2.2%	0.0%	0.0%	0.0%	4.4%	0.0%	1.0%	7.0%	7.1%	0.0%	3.7%	10.1%	40.3%
2003	1053	2,3,4,5	0.6%	0.4%	0.0%	0.0%	0.0%	11.1%	2.3%	0.0%	3.4%	0.0%	0.0%	0.0%	6.8%	0.0%	0.2%	4.1%	9.1%	0.0%	6.2%	12.6%	43.2%
2004	1469	2,3,4,5	0.5%	0.4%	0.0%	0.0%	0.0%	14.5%	3.3%	0.1%	3.1%	0.0%	0.6%	0.0%	6.6%	0.0%	0.5%	7.5%	8.6%	0.0%	4.8%	1.4%	48.1%
2005	1755	2,3,4,5	0.3%	0.1%	0.0%	0.1%	1.0%	11.3%	8.8%	0.0%	7.3%	0.0%	0.0%	0.0%	7.2%	0.0%	1.3%	2.5%	10.1%	0.0%	2.7%	6.5%	40.7%
2006	1203	2,3,4,5	0.4%	0.2%	0.0%	0.8%	0.0%	11.7%	2.0%	0.0%	5.4%	0.0%	0.0%	0.0%	5.7%	0.0%	0.4%	7.9%	11.1%	0.0%	6.4%	1.5%	46.4%
2007	2018	2,3,4,5	0.2%	0.7%	0.0%	0.0%	0.0%	9.1%	1.7%	0.0%	3.1%	0.0%	0.0%	0.0%	3.6%	0.0%	0.1%	2.5%	18.8%	0.0%	10.4%	12.9%	36.8%
2008	1246	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	4.6%	0.0%	3.4%	0.0%	0.0%	0.0%	1.5%	0.5%	0.7%	6.2%	12.6%	0.0%	10.2%	0.0%	56.3%
2009	1743	2,3,4,5	0.0%	0.0%	0.0%	0.2%	0.0%	5.2%	5.7%	0.0%	8.9%	0.0%	0.0%	0.0%	2.2%	0.0%	0.4%	3.6%	20.1%	0.0%	3.2%	0.0%	50.6%
2010	2010	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.0%	9.2%	5.3%	0.0%	1.7%	0.0%	0.0%	0.0%	4.7%	0.0%	0.4%	6.2%	12.4%	0.0%	13.2%	6.2%	40.4%
2011	3133	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	2.2%	0.0%	2.8%	0.0%	0.0%	0.0%	2.0%	0.0%	0.3%	6.2%	17.8%	0.0%	11.8%	7.9%	46.4%
1979-2011	1112		0.4%	0.1%	0.0%	0.1%	0.1%	11.1%	3.7%	0.4%	4.1%	0.2%	1.0%	0.0%	5.5%	0.0%	0.4%	7.7%	18.0%	0.0%	6.4%	2.9%	37.9%
1979-1984	953		0.0%	0.0%	0.0%	0.2%	0.2%	17.0%	0.1%	0.5%	3.7%	1.6%	2.2%	0.0%	1.8%	0.0%	0.5%	20.5%	25.4%	0.0%	11.1%	0.0%	15.2%
1985-1995	749		0.1%	0.1%	0.0%	0.1%	0.0%	15.4%	3.2%	1.4%	3.4%	0.1%	2.2%	0.0%	9.4%	0.0%	0.2%	10.5%	22.5%	0.0%	8.0%	0.4%	23.1%
1996-1998	456		1.0%	0.1%	0.0%	0.0%	0.0%	2.1%	2.3%	0.0%	6.7%	0.0%	1.1%	0.0%	3.3%	0.0%	0.2%	0.9%	22.3%	0.0%	0.0%	0.0%	60.1%
1999-2011	1496		0.5%	0.1%	0.0%	0.2%	0.1%	9.4%	5.1%	0.0%	3.9%	0.0%	0.1%	0.0%	4.7%	0.0%	0.6%	4.7%	12.9%	0.0%	6.0%	5.5%	46.1%

Appendix C12. Percent distribution of Hanford Wild Brights total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	112	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	119	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	478	2,3,4	9.2%	1.0%	0.4%	5.0%	0.0%	8.8%	3.6%	0.0%	0.0%	0.4%	0.6%	0.0%	0.6%	0.0%	0.8%	0.0%	0.0%	0.0%	23.2%	6.3%	40.0%
1991	618	2,3,4,5	10.7%	0.0%	1.5%	10.5%	0.5%	5.2%	0.0%	0.0%	1.0%	0.2%	0.0%	0.0%	1.1%	0.0%	0.5%	0.0%	0.0%	0.0%	22.7%	3.9%	42.4%
1992	371	2,3,4,5	15.9%	15.6%	1.3%	6.2%	0.0%	15.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.8%	0.0%	0.0%	0.0%	15.1%	1.3%	27.8%
1993	422	2,3,4,5	19.4%	0.0%	2.1%	3.1%	1.2%	6.2%	1.9%	0.0%	0.0%	0.0%	2.1%	0.0%	3.8%	0.0%	0.0%	0.0%	0.9%	0.0%	14.9%	7.1%	37.2%
1994	774	2,3,4,5	17.1%	3.4%	0.0%	5.3%	0.0%	4.8%	0.0%	0.0%	0.0%	0.3%	1.3%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	12.1%	5.3%	49.9%
1995	692	2,3,4,5	13.4%	0.0%	4.2%	5.5%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.4%	6.9%	57.7%
1996	626	2,3,4,5	12.9%	0.0%	0.0%	1.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	27.3%	7.7%	49.8%
1997	654	2,3,4,5	17.1%	1.2%	1.1%	3.1%	3.1%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	13.8%	7.0%	51.8%
1998	340	2,3,4,5	14.7%	0.0%	0.0%	11.2%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.4%	6.5%	49.4%
1999	279	2,3,4,5	13.3%	0.7%	2.2%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.8%	6.1%	53.4%
2000	235	2,3,4,5	20.0%	0.4%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.5%	5.5%	43.0%
2001	362	2,3,4,5	6.1%	0.8%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	21.3%	14.9%	54.4%
2002	897	2,3,4,5	17.9%	0.0%	1.4%	0.8%	0.6%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.2%	0.0%	0.0%	0.0%	9.7%	10.6%	54.5%
2003	1551	2,3,4,5	13.5%	0.0%	0.9%	4.1%	1.1%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.3%	0.0%	0.0%	0.0%	13.9%	9.2%	55.9%
2004	1903	2,3,4,5	18.6%	2.0%	3.0%	6.5%	3.8%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.4%	0.0%	0.0%	0.0%	13.0%	4.0%	45.2%
2005	467	2,3,4,5	13.3%	0.0%	0.0%	8.8%	3.0%	4.1%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	1.1%	0.0%	0.0%	0.0%	12.0%	15.4%	38.8%
2006	570	2,3,4,5	18.9%	0.0%	1.1%	5.3%	0.0%	2.6%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	14.7%	19.3%	34.9%
2007	314	2,3,4,5	22.9%	0.0%	1.3%	6.7%	7.6%	2.5%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	16.6%	32.8%
2008	226	2,3,4,5	33.2%	0.0%	5.3%	1.8%	2.2%	3.1%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.7%	7.1%	27.9%
2009	232	2,3,4,5	20.3%	0.0%	0.9%	3.9%	2.2%	1.3%	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	49.6%	4.7%	11.2%
2010	516	2,3,4,5	16.1%	0.0%	4.5%	8.3%	3.7%	0.8%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.6%	0.0%	0.0%	0.0%	11.0%	5.6%	46.1%
2011	554	2,3,4,5	20.2%	0.9%	0.0%	1.8%	5.8%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.9%	1.1%	0.0%	0.0%	0.0%	21.7%	8.3%	36.5%
1979-2011	595		16.6%	1.2%	1.6%	5.1%	1.6%	3.0%	0.8%	0.0%	0.0%	0.0%	0.3%	0.0%	0.9%	0.0%	0.3%	0.0%	0.0%	0.0%	17.6%	8.2%	42.8%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	559		14.3%	3.3%	1.6%	5.9%	0.3%	7.1%	0.9%	0.0%	0.2%	0.1%	0.7%	0.0%	1.2%	0.0%	0.4%	0.0%	0.2%	0.0%	16.2%	5.1%	42.5%
1996-1998	540		14.9%	0.4%	0.4%	5.1%	1.3%	0.5%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	19.5%	7.1%	50.4%
1999-2011	624		18.0%	0.4%	1.9%	4.7%	2.3%	1.7%	1.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.9%	0.1%	0.3%	0.0%	0.0%	0.0%	17.8%	9.8%	41.1%

Appendix C13. Percent distribution of Harrison River (Fraser Late) total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM															
	# of		SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	1374	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	2963	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	1861	2,3,4	0.3%	0.0%	0.0%	1.2%	0.1%	25.2%	0.7%	8.9%	26.9%	1.8%	5.0%	0.0%	1.1%	0.0%	0.2%	4.5%	3.9%	0.0%	0.0%	0.3%	20.0%
1986	921	2,3,4,5	1.7%	0.0%	0.0%	0.4%	0.4%	18.2%	0.4%	19.2%	24.1%	2.8%	11.3%	0.0%	0.0%	0.0%	0.0%	1.2%	4.1%	0.0%	0.0%	0.0%	16.0%
1987	530	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.0%	10.4%	0.0%	9.4%	27.4%	0.8%	5.5%	0.0%	3.8%	0.0%	0.4%	10.0%	2.5%	0.0%	0.0%	0.9%	28.1%
1988	1318	2,3,4,5	0.5%	0.0%	0.8%	0.0%	0.9%	3.9%	3.6%	11.5%	34.3%	1.4%	6.7%	0.0%	4.8%	0.0%	0.0%	14.6%	7.0%	0.0%	0.0%	0.4%	9.6%
1989	2384	2,3,4,5	0.2%	0.0%	0.0%	0.3%	0.0%	24.3%	1.0%	5.5%	23.9%	0.7%	5.8%	0.0%	6.7%	0.0%	0.1%	5.2%	4.9%	0.0%	0.0%	0.0%	21.3%
1990	2959	2,3,4,5	0.5%	0.0%	0.0%	0.8%	0.0%	19.9%	1.4%	4.7%	11.9%	0.7%	2.8%	0.0%	6.1%	0.0%	0.1%	4.3%	6.0%	0.0%	0.0%	0.3%	40.4%
1991	1627	2,3,4,5	0.0%	0.1%	0.0%	0.0%	0.3%	29.9%	0.0%	8.9%	13.0%	0.4%	5.6%	0.0%	12.4%	0.0%	0.0%	2.8%	4.9%	0.0%	0.0%	0.4%	21.5%
1992	1714	2,3,4,5	0.0%	0.0%	0.0%	0.4%	0.0%	[illegible]	0.0%	13.1%	12.5%	0.2%	1.9%	0.0%	13.1%	0.0%	0.0%	1.2%	7.1%	0.0%	0.0%	0.2%	31.9%
1993	1145	2,3,4,5	1.0%	0.0%	0.0%	0.3%	0.0%	19.0%	0.0%	6.6%	7.6%	0.4%	3.1%	0.0%	10.0%	0.0%	0.0%	0.5%	2.2%	0.0%	0.0%	0.0%	49.3%
1994	452	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	19.0%	2.0%	8.8%	6.4%	0.0%	5.1%	0.0%	3.3%	0.0%	0.0%	3.5%	2.2%	0.0%	0.0%	0.9%	48.7%
1995	355	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	22.0%	1.4%	0.0%	21.1%	0.0%	9.9%	0.0%	9.0%	0.0%	0.6%	6.2%	4.2%	0.0%	0.0%	0.8%	24.8%
1996	1099	2,3,4,5	0.0%	0.3%	0.0%	0.0%	0.0%	1.6%	0.2%	0.0%	23.1%	0.0%	1.3%	0.0%	4.4%	0.0%	0.0%	0.0%	7.6%	0.0%	0.0%	0.0%	61.5%
1997	872	2,3,4,5	1.5%	0.0%	0.0%	0.0%	0.3%	12.8%	3.6%	0.1%	18.8%	0.0%	4.5%	0.0%	9.4%	0.0%	0.0%	3.3%	6.3%	0.0%	0.0%	0.0%	39.3%
1998	1142	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	3.5%	0.0%	0.6%	0.0%	5.1%	0.0%	0.0%	0.3%	0.4%	0.0%	0.0%	0.0%	88.7%
1999	1295	2,3,4,5	0.3%	0.5%	0.0%	0.5%	0.7%	0.6%	1.8%	0.0%	8.4%	0.3%	0.6%	0.0%	13.8%	0.0%	0.4%	0.9%	0.6%	0.0%	0.0%	0.2%	70.3%
2000	668	2,3,4,5	1.8%	0.0%	0.0%	0.4%	0.0%	12.0%	3.7%	0.0%	9.9%	0.0%	0.0%	0.0%	13.3%	0.0%	0.0%	0.7%	0.6%	0.0%	0.0%	0.0%	57.5%
2001	836	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	6.8%	2.5%	0.0%	7.2%	0.0%	0.0%	0.0%	7.7%	0.0%	1.8%	1.6%	3.1%	0.0%	0.0%	0.0%	68.9%
2002	393	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	11.7%	3.1%	0.0%	8.1%	0.0%	7.9%	0.0%	15.0%	0.0%	1.5%	3.3%	6.1%	0.0%	0.0%	0.0%	42.7%
2003	572	2,3,4,5	1.0%	0.0%	0.0%	0.0%	0.0%	7.9%	3.8%	0.0%	4.9%	0.0%	1.6%	0.0%	7.0%	0.0%	1.2%	0.3%	1.4%	0.0%	0.0%	0.0%	70.8%
2004	558	2,3,4,5	1.4%	0.0%	0.0%	0.9%	0.0%	18.1%	6.5%	0.0%	0.9%	0.0%	2.5%	0.0%	16.1%	0.0%	0.5%	0.2%	3.2%	0.0%	0.0%	0.0%	49.6%
2005	717	2,3,4,5	0.0%	0.0%	0.0%	0.3%	2.8%	14.4%	3.9%	0.0%	4.6%	0.0%	5.3%	0.0%	6.4%	0.0%	2.6%	0.6%	0.4%	0.0%	0.0%	0.0%	58.7%
2006	446	3,4,5	1.6%	0.0%	0.0%	0.4%	0.0%	22.2%	6.7%	0.0%	2.7%	0.0%	0.0%	0.0%	16.1%	0.0%	0.9%	0.0%	0.7%	0.0%	0.0%	0.0%	48.7%
2007	880	2,4,5	0.1%	0.0%	0.0%	0.0%	0.0%	11.8%	2.3%	0.0%	4.1%	0.0%	0.1%	0.0%	1.5%	0.0%	0.1%	0.8%	1.8%	0.0%	0.0%	0.0%	77.4%
2008	909	2,3,5	0.4%	0.3%	0.0%	0.0%	0.1%	29.2%	13.6%	0.0%	7.4%	0.0%	0.7%	0.0%	5.7%	0.0%	1.2%	2.3%	2.1%	0.0%	0.0%	0.0%	37.0%
2009	2315	2,3,4	0.1%	0.0%	0.0%	0.2%	0.3%	1.7%	4.3%	0.0%	5.5%	0.0%	1.6%	0.0%	1.7%	0.0%	0.3%	0.5%	3.3%	0.0%	0.0%	1.0%	79.7%
2010	2022	2,3,4,5	0.6%	0.0%	0.0%	0.1%	1.3%	3.9%	4.2%	0.0%	4.6%	0.0%	1.1%	0.0%	3.9%	0.0%	1.1%	0.6%	2.0%	0.0%	0.0%	0.3%	76.1%
2011	2718	2,3,4,5	0.2%	0.0%	0.0%	0.2%	1.0%	3.1%	6.1%	0.0%	3.3%	0.0%	2.5%	0.0%	3.0%	0.0%	0.6%	0.6%	2.4%	0.0%	0.0%	0.0%	76.9%
2012	2093	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.3%	1.3%	1.1%	0.0%	9.7%	0.0%	0.1%	0.0%	6.3%	0.0%	0.4%	0.3%	1.6%	0.0%	0.4%	1.0%	77.4%
1979-2012	1243		0.6%	0.0%	0.0%	0.2%	0.3%	13.2%	2.8%	3.5%	12.0%	0.3%	3.3%	0.0%	7.4%	0.0%	0.5%	2.5%	3.3%	0.0%	0.0%	0.2%	49.7%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	1388		0.5%	0.0%	0.1%	0.3%	0.2%	19.1%	1.0%	8.8%	19.0%	0.8%	5.7%	0.0%	6.4%	0.0%	0.1%	4.9%	4.4%	0.0%	0.0%	0.4%	28.3%
1996-1998	1038		0.8%	0.1%	0.0%	0.0%	0.1%	5.0%	1.2%	0.0%	15.1%	0.0%	2.1%	0.0%	6.3%	0.0%	0.0%	1.2%	4.8%	0.0%	0.0%	0.0%	63.2%
1999-2012	1173		0.6%	0.1%	0.0%	0.2%	0.5%	10.3%	4.5%	0.0%	5.8%	0.0%	1.7%	0.0%	8.4%	0.0%	0.9%	0.9%	2.1%	0.0%	0.0%	0.2%	63.7%

Appendix C14. Percent distribution of Hoko Fall Fingerling total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	10	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	141	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	356	2,3,4	11.2%	3.7%	0.3%	8.4%	0.0%	13.5%	0.0%	0.0%	1.7%	1.1%	16.0%	0.0%	0.6%	0.0%	0.6%	1.4%	21.1%	0.0%	0.0%	0.0%	20.5%
1990	679	3,4,5	18.1%	4.1%	0.6%	8.5%	0.0%	17.1%	0.0%	0.4%	0.3%	0.9%	3.7%	0.0%	0.6%	0.0%	0.0%	0.6%	14.4%	0.0%	0.1%	0.0%	30.5%
1991	1327	2,4,5,6	18.1%	0.0%	0.1%	5.2%	0.5%	7.1%	0.5%	0.0%	0.5%	1.1%	0.9%	0.0%	0.2%	0.0%	0.1%	0.9%	8.8%	0.0%	0.1%	0.0%	56.0%
1992	670	2,3,5,6	8.1%	10.4%	1.5%	5.2%	0.6%	9.7%	1.9%	0.0%	0.6%	1.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.1%	0.0%	56.9%
1993	349	2,3,4,6	11.7%	1.1%	2.3%	7.7%	0.0%	14.9%	0.0%	0.0%	0.9%	0.0%	4.6%	0.0%	0.0%	0.0%	0.6%	0.0%	4.3%	0.0%	0.3%	0.0%	51.6%
1994	405	2,3,4,5	19.3%	8.1%	2.7%	13.1%	0.0%	10.4%	2.0%	0.0%	2.0%	0.5%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	39.3%
1995	827	2,3,4,5,6	15.7%	0.0%	4.7%	7.9%	0.6%	3.7%	0.0%	0.0%	1.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	64.9%
1996	689	2,3,4,5,6	14.1%	0.0%	4.4%	0.7%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	79.1%
1997	917	2,3,4,5,6	16.6%	0.0%	0.0%	1.6%	0.5%	1.1%	0.5%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	78.8%
1998	1155	2,3,4,5,6	9.6%	0.0%	0.3%	7.2%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	82.3%
1999	771	2,3,4,5,6	7.8%	0.0%	0.6%	7.8%	1.3%	0.0%	1.4%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	80.7%
2000	521	2,3,4,5,6	6.0%	0.2%	2.9%	0.0%	0.0%	0.2%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	88.9%
2001	541	2,3,4,5,6	8.3%	0.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	85.8%
2002	711	2,3,4,5,6	20.0%	0.0%	1.0%	4.8%	3.5%	1.4%	0.0%	0.0%	2.3%	0.3%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	65.7%
2003	981	2,3,4,5,6	15.0%	0.1%	2.9%	3.3%	0.0%	0.0%	0.6%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	76.2%
2004	1090	2,3,4,5,6	12.7%	0.0%	1.2%	9.5%	2.1%	0.7%	0.9%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.6%	0.0%	0.0%	0.0%	69.4%
2005	642	2,3,4,5,6	13.6%	0.2%	1.2%	12.0%	6.2%	0.0%	1.2%	0.0%	5.5%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	58.4%
2006	799	2,3,4,5,6	10.8%	1.5%	2.4%	6.3%	3.9%	0.0%	1.4%	0.0%	0.8%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	71.8%
2007	306	2,3,4,5,6	17.0%	0.3%	4.6%	7.5%	5.9%	0.7%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	1.3%	0.0%	0.0%	0.0%	60.5%
2008	93	2,3,4,5,6	20.4%	0.0%	6.5%	7.5%	16.1%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.2%
2009	351	2,3,4,5,6	12.5%	0.0%	0.0%	8.3%	1.4%	0.0%	1.1%	0.0%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	69.5%
2010	717	2,3,4,5,6	2.5%	0.0%	2.4%	4.9%	0.7%	0.7%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	86.5%
2011	1102	2,3,4,5,6	9.8%	1.0%	0.8%	2.3%	1.0%	1.1%	0.8%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	1.0%	0.0%	0.0%	0.0%	81.6%
1979-2011	696		13.0%	1.3%	2.0%	6.1%	1.9%	3.6%	0.6%	0.0%	1.5%	0.2%	1.3%	0.0%	0.2%	0.0%	0.2%	0.1%	2.6%	0.0%	0.0%	0.0%	65.2%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	659		14.6%	3.9%	1.7%	8.0%	0.2%	10.9%	0.6%	0.1%	1.0%	0.7%	4.2%	0.0%	0.2%	0.0%	0.2%	0.4%	7.4%	0.0%	0.1%	0.0%	45.7%
1996-1998	920		13.4%	0.0%	1.6%	3.2%	0.2%	0.8%	0.3%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	80.1%
1999-2011	663		12.0%	0.3%	2.3%	5.7%	3.2%	0.4%	0.7%	0.0%	2.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.5%	0.0%	0.0%	0.0%	72.3%

Appendix C15. Percent distribution of Kitsumkalum River Summer (North/Central B.C.) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	8	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	28	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984[1]	83	3,4,5	56.6%	0.0%	0.0%	19.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985	195	4,5,6	29.2%	0.0%	1.5%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	48.7%
1986	216	3,5,6	10.2%	0.0%	0.0%	13.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	64.8%
1987	266	3,4,6	13.2%	0.0%	2.6%	9.8%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	62.0%
1988	204	3,4,5	24.0%	1.5%	4.9%	7.4%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	18.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	36.8%
1989	854	3,4,5,6	14.3%	0.8%	6.9%	5.3%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	10.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	55.4%
1990	637	3,4,5,6	11.6%	0.0%	3.3%	7.8%	2.0%	0.0%	0.0%	0.0%	0.0%	0.3%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.4%	61.7%
1991	335	3,4,5,6	19.4%	0.0%	4.2%	10.7%	6.6%	0.0%	0.0%	0.0%	0.0%	0.9%	14.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	36.7%
1992	695	3,4,5,6	15.3%	0.0%	2.0%	7.9%	5.6%	0.4%	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	58.4%
1993	242	3,4,5,6	11.6%	1.7%	2.1%	11.6%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	17.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.8%
1994	132	3,4,5,6	13.6%	0.0%	0.0%	6.8%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	18.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	55.3%
1995	218	3,4,5,6	13.3%	0.0%	2.8%	9.6%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	31.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%	35.8%
1996	558	3,4,5,6	10.4%	0.2%	6.6%	0.2%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	20.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%	57.7%
1997	656	3,4,5,6	12.2%	0.0%	8.8%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	8.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	59.6%
1998	509	3,4,5,6	10.4%	0.0%	3.5%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%	78.6%
1999	744	3,4,5,6	13.7%	0.0%	10.2%	0.0%	11.8%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	60.3%
2000	365	3,4,5,6	10.4%	0.0%	10.1%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	7.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	60.8%
2001	641	3,4,5,6	10.9%	0.0%	9.0%	0.6%	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	20.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	51.6%
2002	1035	3,4,5,6	14.6%	0.4%	6.2%	1.6%	11.9%	0.0%	0.0%	0.0%	0.6%	0.0%	7.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	55.6%
2003	638	3,4,5,6	15.7%	0.0%	1.9%	5.8%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	66.1%
2004	974	3,4,5,6	8.5%	3.4%	5.6%	0.9%	10.2%	0.0%	0.0%	0.0%	0.0%	0.0%	[illegible]	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	67.9%
2005	345	3,4,5,6	17.1%	0.0%	2.9%	2.6%	7.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.1%	63.8%
2006	311	3,4,5,6	14.1%	3.9%	2.3%	2.9%	6.4%	0.0%	0.0%	0.0%	0.0%	0.0%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	58.5%
2007	552	3,4,5,6	13.0%	0.7%	3.3%	1.6%	9.6%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	67.0%
2008	535	3,4,5,6	6.7%	0.4%	2.1%	2.6%	16.3%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.4%	48.0%
2009	707	3,4,5,6	13.2%	2.7%	5.4%	1.3%	7.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	68.3%
2010	1024	3,4,5,6	5.6%	0.4%	4.0%	2.2%	12.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	69.8%
2011	553	3,4,5,6	11.6%	0.0%	0.9%	1.6%	15.4%	0.0%	0.0%	0.0%	0.0%	0.0%	7.8%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	60.4%
2012	215	4,5,6	17.2%	1.9%	2.3%	1.4%	16.3%	0.0%	0.0%	0.0%	0.0%	0.0%	7.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.0%
1979-2012	498		15.1%	0.6%	4.0%	4.9%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	55.6%
1979-1984	83		56.6%	0.0%	0.0%	19.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	363		16.0%	0.4%	2.8%	9.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.1%	14.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	51.5%
1996-1998	574		11.0%	0.1%	6.3%	0.1%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	10.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	65.3%
1999-2012	617		12.3%	1.0%	4.7%	1.8%	10.3%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	60.8%

[1] Estimates for this year can only be used for distribution of fishing mortalities because the escapement data are insufficient.

Appendix C16. Percent distribution of Lower River Hatchery Tule (Lower Bonneville Hatchery) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													Esc.
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	
1979	163	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	676	2,3,4	0.4%	0.0%	0.0%	0.1%	0.0%	29.1%	1.0%	0.0%	2.1%	0.7%	5.3%	0.0%	23.7%	0.7%	9.0%	2.8%	9.6%	0.0%	3.8%	0.0%	11.4%
1981	3208	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	31.9%	0.3%	0.0%	1.7%	0.5%	2.3%	0.0%	24.8%	0.0%	8.0%	0.6%	3.7%	0.0%	1.2%	0.2%	24.7%
1982	3559	2,3,4,5	0.0%	0.0%	0.0%	0.3%	0.0%	27.2%	0.5%	0.0%	0.8%	1.9%	0.3%	0.0%	20.6%	0.2%	7.6%	2.2%	1.4%	0.0%	13.3%	0.1%	23.7%
1983	2039	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.1%	36.4%	0.4%	0.0%	1.4%	2.5%	0.8%	0.0%	12.4%	0.0%	4.4%	1.6%	5.3%	0.0%	5.2%	0.0%	29.6%
1984	1632	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	51.5%	0.2%	0.5%	0.8%	3.4%	1.5%	0.0%	6.3%	0.0%	1.2%	0.9%	1.4%	0.0%	10.6%	1.5%	20.2%
1985	1105	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	30.0%	0.7%	0.0%	1.1%	0.9%	1.5%	0.0%	17.7%	0.3%	3.8%	1.4%	1.6%	0.0%	2.4%	0.5%	37.9%
1986	1927	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.2%	8.7%	2.4%	0.0%	2.1%	0.0%	6.7%	0.0%	6.2%	0.0%	1.9%	1.9%	21.6%	0.0%	10.9%	4.3%	33.2%
1987	9041	2,3,4,5	0.0%	0.0%	0.0%	0.2%	0.0%	33.0%	2.2%	0.0%	0.4%	1.9%	0.2%	0.0%	17.3%	0.5%	3.6%	0.6%	1.5%	0.0%	17.4%	3.4%	17.6%
1988	2693	2,3,4,5	0.3%	0.0%	0.0%	0.3%	0.0%	31.7%	2.4%	0.0%	1.0%	0.6%	0.0%	0.0%	11.8%	0.5%	0.9%	0.3%	0.5%	0.0%	22.4%	1.8%	25.5%
1989	277	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	17.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	25.3%	0.0%	2.2%	0.0%	2.5%	0.0%	5.4%	0.7%	45.1%
1990	323	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	22.9%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	18.3%	0.0%	7.1%	0.0%	1.9%	0.0%	0.3%	2.8%	44.9%
1991	515	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%	2.3%	0.0%	2.5%	0.2%	2.3%	0.0%	10.7%	0.0%	4.7%	0.4%	2.7%	0.0%	2.5%	10.3%	49.7%
1992	1326	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	19.5%	1.8%	0.0%	0.0%	0.6%	0.8%	0.0%	30.5%	0.0%	5.2%	0.0%	2.0%	0.0%	0.8%	3.5%	35.1%
1993	531	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	20.9%	4.3%	0.0%	0.0%	0.8%	0.0%	0.0%	20.9%	0.0%	2.4%	0.0%	4.5%	0.0%	1.9%	4.3%	39.9%
1994	31	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	29.0%	0.0%	0.0%	12.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	58.1%
1995	31	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	12.9%	83.9%
1996	66	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%	0.0%	7.6%	0.0%	80.3%
1997	226	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	21.7%	3.5%	0.0%	3.1%	0.0%	0.0%	0.0%	8.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.9%	8.8%	50.9%
1998	116	2,3,4,5	0.0%	0.0%	0.0%	0.0%	5.2%	0.9%	10.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	1.7%	0.0%	0.0%	0.0%	1.7%	22.4%	56.9%
1999	334	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	9.3%	0.0%	0.0%	0.0%	0.0%	0.0%	7.8%	0.0%	3.3%	0.0%	0.0%	0.0%	3.6%	6.3%	67.7%
2000	282	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%	12.1%	0.0%	4.6%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	3.9%	0.0%	2.5%	3.2%	55.7%
2001	1234	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	2.4%	0.0%	0.5%	0.0%	0.0%	0.0%	20.7%	0.0%	3.6%	0.1%	1.1%	0.0%	1.4%	4.7%	57.2%
2002	2032	2,3,4,5	0.4%	0.0%	0.0%	0.0%	0.0%	9.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	21.0%	0.0%	7.2%	0.1%	0.0%	0.0%	7.4%	2.8%	49.1%
2003	2133	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	13.1%	5.7%	0.0%	0.5%	0.0%	0.0%	0.0%	14.8%	0.0%	6.2%	0.0%	0.8%	0.0%	6.0%	2.0%	51.1%
2004	1623	2,3,4,5	0.5%	0.0%	0.0%	0.3%	0.3%	21.2%	8.8%	0.0%	0.5%	0.0%	0.0%	0.0%	8.5%	0.0%	3.6%	0.0%	0.1%	0.0%	15.4%	1.2%	39.6%
2005	625	2,3,4,5	0.0%	0.0%	0.0%	0.3%	0.0%	29.0%	7.4%	0.0%	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%	2.1%	0.0%	0.0%	0.0%	16.3%	0.2%	38.1%
2006	89	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	15.7%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	10.1%	1.1%	55.1%
2007	166	2,3,4,5	0.0%	1.2%	0.0%	0.0%	0.0%	10.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	0.0%	2.4%	0.0%	0.0%	0.0%	5.4%	3.0%	70.5%
2008	402	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	11.2%	9.7%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	7.0%	0.0%	0.0%	0.0%	24.1%	3.5%	40.0%
2009	620	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	9.2%	0.0%	5.5%	0.0%	0.0%	0.0%	3.9%	0.0%	4.7%	0.0%	10.0%	0.0%	30.5%	2.7%	29.7%
2010	1602	2,3,4,5	0.1%	0.0%	0.0%	0.2%	1.4%	6.6%	6.3%	0.0%	1.4%	0.0%	0.0%	0.0%	18.4%	0.3%	5.4%	0.0%	0.4%	0.0%	29.2%	3.4%	26.9%
2011	881	2,3,4,5	0.0%	0.0%	0.0%	0.0%	1.2%	9.2%	6.1%	0.0%	1.0%	0.0%	0.0%	0.0%	6.6%	3.0%	7.5%	0.0%	3.5%	0.0%	19.2%	3.2%	39.5%
1979-2011	1292		0.1%	0.0%	0.0%	0.1%	0.3%	18.2%	4.0%	0.0%	1.4%	0.4%	0.8%	0.0%	12.1%	0.2%	3.7%	0.4%	2.5%	0.0%	8.8%	3.6%	43.4%
1979-1984	2223		0.1%	0.0%	0.0%	0.1%	0.0%	35.2%	0.5%	0.1%	1.3%	1.8%	2.1%	0.0%	17.5%	0.2%	6.0%	1.6%	4.3%	0.0%	6.8%	0.4%	21.9%
1985-1995	1618		0.0%	0.0%	0.0%	0.0%	0.0%	20.4%	1.5%	0.0%	1.8%	0.5%	1.4%	0.0%	14.4%	0.1%	2.9%	0.4%	3.5%	0.0%	6.1%	4.1%	42.8%
1996-1998	136		0.0%	0.0%	0.0%	0.0%	1.7%	9.0%	4.6%	0.0%	1.0%	0.0%	0.0%	0.0%	5.5%	0.0%	1.6%	0.0%	0.0%	0.0%	3.4%	10.4%	62.7%
1999-2011	925		0.1%	0.1%	0.0%	0.1%	0.2%	12.0%	7.4%	0.0%	1.1%	0.0%	0.0%	0.0%	9.5%	0.3%	4.1%	0.0%	1.5%	0.0%	13.2%	2.9%	47.7%

Appendix C17. Percent distribution of Lewis River Wild (Lewis River Wild) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	193	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	302	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	1208	2,3,4	7.5%	0.0%	0.0%	3.6%	2.2%	7.0%	0.0%	0.0%	0.0%	1.6%	1.0%	0.0%	2.6%	0.0%	2.9%	0.2%	0.2%	0.0%	4.8%	12.7%	53.7%
1982	970	3,4,5	7.6%	0.8%	0.1%	3.3%	0.0%	11.1%	0.0%	0.4%	0.0%	1.5%	1.4%	0.0%	4.3%	0.8%	7.6%	0.6%	0.8%	0.0%	4.6%	15.1%	39.7%
1983	1081	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	379	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	381	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	694	2,3,4	6.1%	0.0%	0.0%	2.3%	0.0%	8.1%	2.6%	0.0%	0.0%	2.2%	1.0%	0.0%	3.7%	0.0%	0.6%	0.0%	0.0%	0.0%	26.8%	11.0%	35.7%
1987	1209	2,3,4,5	5.5%	0.0%	0.0%	5.2%	0.0%	9.3%	0.9%	0.0%	0.0%	1.4%	0.0%	0.0%	2.8%	0.4%	0.9%	0.0%	0.3%	0.0%	26.6%	4.8%	41.8%
1988	1036	2,3,4,5	5.1%	0.0%	0.0%	3.4%	0.0%	10.4%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	4.8%	0.0%	1.1%	0.0%	1.4%	0.0%	24.2%	14.5%	34.6%
1989	1358	2,3,4,5	2.4%	0.7%	0.3%	5.1%	0.4%	5.8%	0.5%	0.0%	0.0%	0.2%	1.5%	0.0%	5.4%	0.3%	0.7%	0.0%	0.0%	0.0%	9.6%	6.8%	60.2%
1990	1216	2,3,4,5	7.6%	0.0%	0.0%	1.9%	0.6%	13.4%	0.8%	0.0%	0.0%	0.5%	0.7%	0.0%	4.2%	0.0%	1.9%	0.0%	1.3%	0.0%	3.4%	2.2%	61.6%
1991	921	2,3,4,5	7.2%	0.2%	0.0%	4.1%	1.2%	6.4%	0.0%	0.0%	0.0%	0.4%	0.7%	0.0%	2.5%	0.0%	1.1%	0.0%	0.0%	0.0%	15.6%	6.3%	54.3%
1992	581	2,3,4,5	1.7%	0.0%	0.0%	4.3%	0.7%	6.7%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	3.1%	0.0%	0.7%	0.0%	1.0%	0.0%	5.0%	22.5%	52.3%
1993	406	2,3,4,5	4.4%	0.0%	1.2%	5.7%	0.0%	8.4%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	1.5%	0.0%	0.5%	0.0%	0.0%	0.0%	7.1%	8.6%	60.8%
1994	265	2,3,4,5	9.1%	0.0%	0.0%	4.9%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	78.5%
1995	556	2,3,4,5	7.4%	0.0%	2.3%	4.0%	0.0%	6.5%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.6%	54.7%
1996	333	2,3,4,5	9.3%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	4.8%	81.7%
1997	233	3,4,5	15.0%	0.0%	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	77.3%
1998	101	2,4,5	7.9%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	2.0%	83.2%
1999	62	2,3,5	17.7%	0.0%	1.6%	8.1%	0.0%	1.6%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	67.7%
2000	73	2,3,4	6.8%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	15.1%	2.7%	71.2%
2001	237	2,3,4,5	5.9%	0.0%	1.7%	0.0%	0.0%	8.9%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	3.0%	0.0%	0.0%	0.0%	2.5%	3.0%	65.0%
2002	391	2,3,4,5	14.6%	0.0%	1.8%	0.0%	0.0%	5.4%	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	0.0%	2.3%	0.0%	0.0%	0.0%	4.9%	2.6%	56.3%
2003	477	2,3,4,5	10.5%	0.0%	0.0%	1.7%	1.3%	4.8%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	10.3%	0.0%	1.0%	0.0%	0.0%	0.0%	6.7%	5.9%	56.6%
2004	2181	2,3,4,5	6.7%	0.0%	0.6%	3.3%	0.9%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.1%	0.0%	0.0%	0.0%	2.5%	1.9%	81.2%
2005	393	2,3,4,5	4.1%	0.0%	0.0%	13.0%	7.4%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.8%	0.0%	0.0%	0.0%	11.7%	8.9%	48.1%
2006	594	2,3,4,5	14.5%	0.0%	0.5%	6.6%	1.9%	8.4%	1.0%	0.0%	1.9%	0.0%	0.0%	0.0%	1.5%	0.0%	0.5%	0.0%	0.0%	0.0%	5.6%	19.2%	38.6%
2007	209	2,3,4,5	37.3%	0.0%	1.0%	6.7%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.2%	0.0%	2.9%	0.0%	0.0%	0.0%	2.9%	0.0%	40.2%
2008	142	2,3,4,5	7.7%	0.0%	0.0%	0.0%	4.9%	12.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	0.7%	0.0%	5.6%	0.0%	0.0%	4.9%	57.7%
2009	179	2,3,4,5	20.1%	0.0%	0.0%	3.4%	3.9%	6.1%	19.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.6%	3.9%	41.9%
2010	201	2,3,4,5	6.5%	0.0%	0.0%	5.0%	2.5%	1.5%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	4.5%	0.0%	0.0%	0.0%	2.0%	8.0%	63.7%
2011	226	2,3,4,5	11.9%	0.0%	1.3%	11.9%	1.3%	4.9%	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	6.2%	0.0%	0.0%	0.0%	1.8%	20.8%	32.3%
1979-2011	588		9.6%	0.1%	0.5%	4.2%	1.0%	5.7%	1.6%	0.0%	0.1%	0.3%	0.4%	0.0%	3.2%	0.1%	1.5%	0.0%	0.4%	0.0%	6.7%	7.9%	56.8%
1979-1984	1089		7.6%	0.4%	0.1%	3.5%	1.1%	9.1%	0.0%	0.2%	0.0%	1.6%	1.2%	0.0%	3.4%	0.4%	5.3%	0.4%	0.5%	0.0%	4.7%	13.9%	46.7%
1985-1995	824		5.6%	0.1%	0.4%	4.1%	0.3%	7.9%	0.5%	0.0%	0.0%	0.7%	0.8%	0.0%	2.9%	0.1%	0.7%	0.0%	0.4%	0.0%	12.0%	10.1%	53.5%
1996-1998	222		10.8%	0.0%	0.0%	3.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	3.3%	80.7%
1999-2011	413		12.6%	0.0%	0.8%	4.6%	1.8%	4.8%	3.0%	0.0%	0.1%	0.0%	0.0%	0.0%	4.0%	0.0%	1.8%	0.0%	0.4%	0.0%	4.3%	6.3%	55.4%

Appendix C18. Percent distribution of Lyons Ferry Fingerling (Lyons Ferry Hatchery) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	332	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	770	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	761	2,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	404	2,3,5	1.7%	0.0%	0.0%	5.9%	0.0%	17.6%	1.7%	0.0%	0.0%	0.0%	3.0%	0.0%	14.9%	0.0%	5.2%	0.0%	0.0%	0.0%	19.6%	1.7%	28.7%
1990	543	2,3,4	2.9%	0.0%	0.0%	2.6%	0.0%	18.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	13.4%	0.0%	4.2%	0.0%	0.0%	0.0%	24.9%	1.1%	32.2%
1991	311	2,3,4,5	2.6%	0.0%	2.3%	4.8%	0.0%	13.2%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	3.5%	0.0%	2.3%	0.0%	0.0%	0.0%	12.5%	1.0%	56.6%
1992	268	3,4,5	1.9%	0.0%	0.0%	7.1%	1.5%	11.9%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	0.0%	1.5%	0.0%	6.7%	6.0%	52.2%
1993	235	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	103	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	39	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	42	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	160	4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	122	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	807	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	1704	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	1151	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	417	2,4,5	9.8%	0.0%	0.0%	2.2%	0.2%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.7%	0.0%	2.9%	0.0%	0.2%	0.0%	15.6%	1.4%	49.4%
2004	358	2,3,5	6.4%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	2.8%	0.0%	0.6%	0.0%	9.8%	1.7%	74.0%
2005	293	2,3,4	5.1%	0.3%	0.0%	4.4%	3.1%	5.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.5%	0.0%	4.1%	0.0%	3.4%	0.0%	19.1%	1.7%	46.8%
2006	222	2,3,4,5	8.6%	0.0%	0.0%	0.9%	5.9%	1.4%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%	0.0%	2.7%	0.0%	0.0%	0.0%	15.8%	2.3%	48.2%
2007	583	2,3,4,5	0.3%	0.3%	0.0%	0.5%	0.0%	4.1%	1.0%	0.0%	3.3%	0.0%	0.0%	0.0%	1.2%	0.0%	0.7%	0.0%	3.9%	0.0%	11.3%	5.5%	67.8%
2008	1111	2,3,4,5	0.5%	0.0%	0.0%	0.4%	1.2%	13.7%	3.3%	0.0%	0.8%	0.0%	0.0%	0.0%	9.2%	0.0%	5.0%	0.1%	0.4%	0.0%	19.4%	5.9%	40.3%
2009	1496	2,3,4,5	2.1%	0.1%	0.5%	1.9%	0.0%	4.0%	4.5%	0.0%	0.8%	0.0%	0.0%	0.0%	3.7%	0.0%	3.0%	0.0%	0.9%	0.0%	31.6%	9.5%	37.2%
2010	1921	2,3,4,5	1.7%	0.2%	0.0%	2.1%	0.3%	7.6%	7.2%	0.0%	0.0%	0.0%	0.0%	0.0%	17.1%	0.0%	12.6%	0.0%	0.7%	0.0%	30.6%	6.6%	13.2%
2011	1326	3,4,5	3.3%	0.0%	0.2%	2.0%	0.8%	8.7%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	10.5%	0.0%	5.5%	0.0%	1.7%	0.0%	37.0%	10.4%	13.5%
1979-2011	712		3.6%	0.1%	0.2%	2.8%	1.0%	8.5%	2.4%	0.0%	0.4%	0.0%	0.4%	0.0%	8.9%	0.0%	3.9%	0.0%	1.0%	0.0%	19.5%	4.2%	43.1%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	382		2.3%	0.0%	0.6%	5.1%	0.4%	15.2%	1.5%	0.0%	0.0%	0.0%	1.2%	0.0%	9.7%	0.0%	2.9%	0.0%	0.4%	0.0%	15.9%	2.4%	42.4%
1996-1998	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1999-2011	859		4.2%	0.1%	0.1%	1.7%	1.3%	5.5%	2.8%	0.0%	0.5%	0.0%	0.0%	0.0%	8.6%	0.0%	4.4%	0.0%	1.3%	0.0%	21.1%	5.0%	43.4%

Appendix C19. Percent distribution of Lyons Ferry Yearling total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	175	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	464	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	1810	2,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	1782	2,3,5	0.3%	0.6%	0.0%	1.6%	0.0%	8.9%	6.7%	0.1%	0.0%	0.5%	3.4%	0.0%	13.9%	0.0%	2.9%	0.7%	2.2%	0.0%	15.9%	2.6%	39.7%
1990	3827	2,3,4	0.5%	0.0%	0.0%	0.6%	0.0%	16.8%	3.2%	0.0%	0.1%	0.7%	1.2%	0.0%	19.8%	0.0%	5.1%	0.4%	2.8%	0.0%	13.7%	1.3%	33.7%
1991	2918	3,4,5	0.2%	0.0%	0.0%	0.7%	0.0%	12.0%	2.0%	0.2%	0.2%	0.1%	1.8%	0.0%	12.5%	0.0%	2.1%	0.4%	1.1%	0.0%	15.7%	1.1%	50.0%
1992	2198	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	722	2,5	Failed	Criteria	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	413	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	3373	2,3,4	0.3%	0.0%	0.0%	0.8%	0.2%	1.0%	0.6%	0.0%	0.0%	0.1%	0.9%	0.0%	0.9%	0.0%	0.2%	0.4%	0.1%	0.0%	6.0%	4.5%	84.0%
1996	3270	2,3,4,5	0.6%	0.1%	0.0%	1.4%	0.2%	0.8%	0.6%	0.0%	0.0%	0.0%	1.3%	0.0%	6.3%	0.0%	0.1%	0.0%	0.1%	0.0%	16.8%	3.5%	68.3%
1997	3615	2,3,4,5	1.6%	0.1%	0.0%	1.0%	0.2%	4.3%	1.0%	0.0%	0.0%	0.4%	0.6%	0.0%	7.1%	0.0%	0.8%	0.0%	0.1%	0.0%	12.7%	4.6%	65.6%
1998	5888	2,3,4,5	1.6%	0.1%	0.2%	2.4%	1.3%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	2.9%	0.0%	0.4%	0.0%	0.1%	0.0%	10.2%	5.9%	74.7%
1999	7278	2,3,4,5	1.4%	0.1%	0.3%	0.9%	0.6%	1.2%	1.4%	0.0%	0.0%	0.1%	0.1%	0.0%	13.4%	0.0%	2.5%	0.0%	0.0%	0.0%	8.1%	4.1%	65.8%
2000	6680	2,3,4,5	1.6%	0.0%	0.1%	0.1%	0.1%	6.2%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	4.2%	0.0%	0.0%	0.0%	11.5%	4.3%	61.9%
2001	10143	2,3,4,5	0.7%	0.0%	0.1%	0.0%	0.4%	7.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	20.4%	0.0%	5.1%	0.0%	0.6%	0.0%	13.7%	3.8%	45.9%
2002	7057	2,3,4,5	1.3%	0.2%	0.0%	0.8%	0.7%	6.9%	1.6%	0.0%	0.0%	0.0%	0.4%	0.0%	18.1%	0.0%	10.8%	0.2%	0.2%	0.0%	11.5%	4.4%	43.0%
2003	7780	2,3,4,5	0.8%	0.0%	0.1%	0.2%	0.1%	8.6%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	10.7%	0.0%	4.4%	0.0%	0.4%	0.0%	11.5%	3.2%	58.2%
2004	10170	2,3,4,5	0.5%	0.0%	0.0%	0.4%	0.3%	5.3%	1.2%	0.0%	0.1%	0.0%	0.0%	0.0%	12.8%	0.0%	4.5%	0.0%	0.9%	0.0%	7.7%	3.2%	63.0%
2005	7058	2,3,4,5	0.4%	0.0%	0.0%	0.6%	0.7%	10.4%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	14.2%	0.0%	7.7%	0.0%	0.3%	0.0%	12.9%	2.3%	47.7%
2006	4121	2,3,4,5	0.6%	0.0%	0.1%	1.8%	1.2%	6.4%	2.6%	0.0%	0.1%	0.0%	0.0%	0.0%	9.3%	0.0%	3.4%	0.1%	0.6%	0.0%	14.7%	2.6%	56.4%
2007	5192	2,3,4,5	1.4%	0.4%	0.1%	0.7%	0.2%	7.9%	2.5%	0.0%	0.2%	0.0%	0.1%	0.0%	8.6%	0.0%	4.8%	0.0%	0.9%	0.0%	11.6%	3.1%	57.5%
2008	3541	2,3,4,5	0.5%	0.0%	0.0%	0.2%	0.6%	6.1%	3.2%	0.0%	0.5%	0.0%	0.0%	0.0%	6.4%	0.0%	2.5%	0.3%	0.5%	0.0%	19.8%	4.3%	55.3%
2009	5511	2,3,4,5	0.3%	0.1%	0.0%	0.4%	0.3%	3.2%	7.8%	0.0%	1.1%	0.0%	0.0%	0.0%	6.1%	0.0%	9.8%	0.1%	5.6%	0.0%	21.0%	6.9%	37.3%
2010	5103	2,3,4,5	1.0%	0.2%	0.0%	1.4%	0.6%	8.3%	4.6%	0.0%	0.2%	0.0%	0.0%	0.0%	16.5%	0.0%	12.7%	0.0%	0.6%	0.0%	35.4%	4.3%	14.0%
2011	3818	3,4,5	0.8%	0.0%	0.0%	0.6%	0.2%	5.8%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	10.3%	0.1%	11.8%	0.0%	1.3%	0.0%	33.1%	12.5%	19.0%
1979-2011	5406		0.8%	0.1%	0.0%	0.8%	0.4%	6.4%	2.7%	0.0%	0.1%	0.1%	0.5%	0.0%	10.8%	0.0%	4.8%	0.1%	0.9%	0.0%	15.2%	4.1%	52.0%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	2975		0.3%	0.1%	0.0%	0.9%	0.0%	9.7%	3.1%	0.1%	0.1%	0.3%	1.8%	0.0%	11.8%	0.0%	2.6%	0.5%	1.5%	0.0%	12.8%	2.4%	51.9%
1996-1998	4258		1.3%	0.1%	0.1%	1.6%	0.6%	1.7%	0.5%	0.0%	0.0%	0.1%	0.7%	0.0%	5.4%	0.0%	0.4%	0.0%	0.1%	0.0%	13.2%	4.6%	69.5%
1999-2011	6419		0.9%	0.1%	0.1%	0.6%	0.5%	6.4%	3.1%	0.0%	0.2%	0.0%	0.0%	0.0%	11.8%	0.0%	6.5%	0.1%	0.9%	0.0%	16.3%	4.5%	48.1%

Appendix C20. Percent distribution of Nanaimo River Fall (Lower Strait of Georgia Natural) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM																	
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	285	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	1572	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	1879	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	539	2,4,5	4.3%	0.0%	0.0%	1.9%	2.8%	1.7%	0.7%	1.1%	37.5%	12.6%	19.1%	0.0%	0.0%	0.0%	0.0%	0.4%	1.1%	0.0%	0.0%	5.8%	11.1%
1985	58	3,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	29	4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	29	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	431	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	1188	2,3,4	0.2%	0.4%	0.0%	0.8%	2.1%	1.8%	0.7%	7.0%	48.3%	1.0%	8.2%	0.0%	0.7%	0.0%	0.0%	2.7%	0.9%	0.0%	0.2%	6.2%	18.9%
1992	2283	2,3,4,5	0.1%	0.0%	0.0%	0.8%	2.6%	5.2%	0.3%	8.2%	43.4%	1.3%	5.6%	0.0%	0.4%	0.0%	0.1%	0.8%	0.8%	0.0%	0.0%	1.9%	28.6%
1993	1632	2,3,4,5	0.1%	0.4%	0.0%	1.8%	1.5%	2.7%	0.5%	6.1%	53.3%	1.3%	4.4%	0.0%	0.6%	0.0%	0.0%	0.2%	1.0%	0.0%	0.0%	2.9%	23.3%
1994	518	2,3,4,5	0.6%	0.0%	0.0%	0.8%	1.9%	3.3%	1.2%	0.8%	38.8%	0.0%	7.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	1.0%	42.5%
1995	1651	2,3,4,5	0.0%	0.0%	0.0%	0.0%	1.0%	1.5%	0.8%	0.0%	30.5%	0.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.2%	7.3%	53.8%
1996	971	2,3,4,5	0.0%	1.8%	0.0%	0.0%	0.7%	0.3%	0.4%	0.0%	61.6%	0.0%	2.3%	0.0%	0.2%	0.0%	0.0%	0.5%	3.1%	0.0%	3.5%	5.1%	20.5%
1997	286	2,3,4,5	5.6%	0.0%	0.0%	4.2%	0.0%	0.7%	0.3%	0.0%	38.1%	2.8%	2.4%	0.0%	0.0%	1.4%	0.0%	4.5%	4.2%	0.0%	0.0%	3.1%	32.5%
1998	259	2,3,4,5	1.2%	5.4%	0.0%	5.8%	3.9%	0.4%	0.0%	0.0%	27.8%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	15.1%	37.8%
1999	303	2,3,4,5	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	2.0%	0.0%	33.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	3.0%	0.0%	1.0%	3.3%	52.1%
2000	178	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	6.2%	0.0%	27.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	20.2%	38.8%
2001	547	2,4,5	0.2%	0.0%	0.0%	0.0%	0.5%	0.9%	0.0%	0.0%	37.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.4%	9.1%	0.0%	2.4%	0.2%	44.4%
2002	949	2,3,5	0.4%	0.1%	0.0%	0.0%	1.8%	0.9%	0.1%	0.0%	39.7%	0.0%	2.5%	0.0%	0.1%	0.0%	0.0%	2.5%	3.9%	0.0%	4.1%	0.3%	43.4%
2003	864	2,3,4	0.6%	0.7%	0.1%	0.2%	7.1%	3.8%	0.8%	0.0%	19.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	2.0%	3.1%	0.0%	2.1%	0.5%	59.5%
2004	871	2,3,4,5	1.4%	0.0%	0.0%	0.7%	8.4%	5.1%	2.2%	0.0%	10.7%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	1.5%	2.8%	0.0%	5.7%	1.4%	59.4%
2005	517	3,4,5	0.6%	0.0%	0.6%	1.5%	10.8%	6.2%	1.7%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	1.0%	0.0%	19.3%	0.0%	48.0%
2006	1492	2,4,5	0.3%	0.0%	0.0%	0.1%	0.7%	0.5%	0.5%	0.0%	14.3%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.6%	1.8%	0.0%	4.8%	1.0%	75.4%
2007	1087	3,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	261	4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2009	6	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2010	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979-2012	885		0.9%	0.5%	0.0%	1.1%	2.8%	2.2%	1.1%	1.4%	33.5%	1.1%	3.3%	0.0%	0.2%	0.1%	0.0%	1.5%	2.3%	0.0%	2.9%	4.4%	40.6%
1979-1984	539		4.3%	0.0%	0.0%	1.9%	2.8%	1.7%	0.7%	1.1%	37.5%	12.6%	19.1%	0.0%	0.0%	0.0%	0.0%	0.4%	1.1%	0.0%	0.0%	5.8%	11.1%
1985-1995	1454		0.2%	0.2%	0.0%	0.8%	1.8%	2.9%	0.7%	4.4%	42.9%	0.7%	5.7%	0.0%	0.3%	0.0%	0.0%	0.7%	1.3%	0.0%	0.1%	3.9%	33.4%
1996-1998	505		2.3%	2.4%	0.0%	3.3%	1.5%	0.5%	0.3%	0.0%	42.5%	0.9%	2.2%	0.0%	0.1%	0.5%	0.0%	1.7%	2.4%	0.0%	1.4%	7.8%	30.3%
1999-2012	715		0.4%	0.1%	0.1%	0.3%	3.9%	2.5%	1.7%	0.0%	23.7%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	2.1%	3.1%	0.0%	5.6%	3.4%	52.6%

Appendix C21. Percent distribution of Nicola River Spring (Fraser Early) total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	19	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	181	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	1271	2,3,4	0.0%	0.0%	0.0%	0.3%	1.2%	1.3%	0.0%	0.0%	12.4%	0.0%	12.5%	0.0%	0.9%	0.0%	0.0%	1.1%	2.1%	0.0%	0.0%	4.2%	64.0%
1990	279	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	3.2%	0.0%	14.3%	0.0%	1.8%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	15.4%	59.5%
1991	1311	2,3,4,5	0.2%	0.5%	0.0%	0.0%	0.6%	4.1%	0.0%	0.3%	5.[illegible]%	0.2%	14.3%	0.0%	0.8%	0.0%	0.0%	0.2%	1.6%	0.0%	0.0%	8.4%	62.9%
1992	559	2,3,4,5	0.0%	0.0%	0.0%	5.0%	1.8%	5.0%	0.0%	0.0%	9.5%	2.3%	7.2%	0.0%	5.7%	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	9.1%	48.3%
1993	1175	2,3,4,5	0.0%	0.0%	0.0%	3.1%	1.3%	5.7%	1.2%	0.0%	5.9%	0.0%	11.5%	0.0%	2.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	5.7%	61.3%
1994	2047	2,3,4,5	0.0%	0.0%	0.0%	0.2%	0.0%	3.6%	0.4%	0.0%	3.6%	0.0%	1.5%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.2%	82.2%
1995	1882	2,3,4,5	0.0%	0.0%	0.0%	0.2%	0.8%	1.2%	0.5%	0.0%	2.8%	0.0%	5.6%	0.0%	0.1%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	3.6%	84.8%
1996	74	2,3,4,5	0.0%	0.0%	0.0%	4.1%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	18.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.7%
1997	237	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.5%	0.0%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	12.2%	0.0%	0.0%	5.9%	66.7%
1998	849	2,3,4,5	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	1.6%	0.0%	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.5%	82.0%
1999	2424	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	6.9%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	89.4%
2000	1774	2,3,4,5	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	5.0%	0.0%	10.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	77.5%
2001	2174	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	0.0%	4.3%	0.0%	7.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.6%	82.8%
2002	2140	2,3,4,5	0.0%	0.0%	0.0%	1.4%	0.3%	0.7%	0.0%	0.0%	1.3%	0.0%	4.5%	0.0%	0.8%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	2.7%	88.1%
2003	1782	2,3,4,5	0.1%	0.0%	0.0%	2.4%	0.0%	1.0%	0.6%	0.0%	2.6%	0.0%	0.6%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.8%	85.4%
2004	445	2,3,4,5	0.0%	0.0%	0.0%	2.2%	0.0%	2.0%	0.0%	0.0%	4.3%	0.0%	23.6%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	66.7%
2005	381	2,3,4,5	0.0%	0.0%	0.0%	1.3%	0.0%	3.9%	0.0%	0.0%	7.3%	0.0%	7.9%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%	63.0%
2006	395	2,3,4,5	0.0%	0.0%	0.0%	1.8%	0.0%	2.0%	0.0%	0.0%	3.8%	0.0%	5.3%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.6%	75.9%
2007	112	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	8.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	29.5%	55.4%
2008	611	2,3,4,5	0.0%	0.0%	0.0%	1.3%	1.0%	0.0%	0.0%	0.0%	5.9%	0.0%	7.5%	0.0%	2.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.5%	3.6%	77.6%
2009	258	2,3,4,5	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	13.2%	0.0%	6.6%	0.0%	3.9%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	22.9%	51.6%
2010	2312	2,3,4,5	0.3%	0.0%	0.0%	1.3%	0.8%	0.0%	0.1%	0.0%	1.2%	0.0%	4.5%	0.0%	0.7%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.1%	90.5%
2011	708	2,3,4,5	0.0%	0.0%	0.0%	0.7%	0.8%	0.0%	0.6%	0.0%	5.2%	0.0%	4.9%	0.0%	2.1%	0.0%	0.3%	0.0%	1.7%	0.0%	0.0%	2.4%	81.2%
2012	676	3,4,5	0.0%	0.0%	0.0%	0.4%	1.9%	0.0%	0.0%	0.0%	2.5%	0.0%	17.8%	0.0%	3.3%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.9%	71.9%
1979-2012	1078		0.0%	0.0%	0.0%	1.1%	0.6%	1.8%	0.1%	0.0%	4.7%	0.1%	8.7%	0.0%	1.3%	0.0%	0.0%	0.1%	1.4%	0.0%	0.0%	7.4%	72.7%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	1218		0.0%	0.1%	0.0%	1.3%	0.8%	3.3%	0.3%	0.0%	6.2%	0.4%	9.6%	0.0%	1.7%	0.0%	0.0%	0.2%	2.3%	0.0%	0.0%	7.8%	66.1%
1996-1998	387		0.0%	0.0%	0.0%	1.4%	0.6%	0.5%	0.0%	0.0%	4.1%	0.0%	9.9%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%	0.0%	0.0%	4.8%	74.8%
1999-2012	1157		0.0%	0.0%	0.0%	0.9%	0.5%	1.3%	0.1%	0.0%	4.1%	0.0%	8.0%	0.0%	1.4%	0.0%	0.1%	0.0%	0.4%	0.0%	0.0%	7.7%	75.5%

Appendix C22. Percent distribution of Nisqually Fall Fingerling total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	25	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	99	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983[1]	301	2,3,4	0.0%	0.0%	0.0%	1.7%	0.0%	13.0%	0.0%	1.7%	7.3%	0.0%	4.7%	0.0%	3.0%	0.0%	0.0%	8.3%	56.5%	0.0%	3.0%	0.0%	1.0%
1984[1]	251	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	30.3%	0.0%	0.0%	1.2%	0.0%	2.0%	0.0%	1.2%	0.0%	0.0%	15.5%	23.9%	0.0%	21.1%	0.0%	4.8%
1985[1]	82	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	26.8%	3.7%	0.0%	0.0%	0.0%	3.7%	0.0%	6.1%	0.0%	0.0%	22.0%	23.2%	0.0%	11.0%	0.0%	3.7%
1986	126	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	15.9%	0.0%	0.0%	12.7%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	11.1%	19.0%	0.0%	22.2%	0.0%	17.5%
1987	191	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	12.6%	0.0%	1.0%	11.0%	2.6%	1.6%	0.0%	5.8%	0.0%	0.0%	1.0%	18.3%	0.0%	33.5%	2.6%	9.9%
1988	479	2,3,4,5	0.0%	0.0%	0.0%	0.6%	2.1%	4.6%	0.0%	2.9%	28.8%	1.7%	3.5%	0.0%	6.5%	0.0%	0.0%	6.5%	16.1%	0.0%	9.4%	0.0%	17.3%
1989	1157	2,3,4,5	0.0%	0.0%	0.0%	0.4%	0.0%	5.4%	6.0%	0.0%	3.0%	0.0%	3.8%	0.0%	14.6%	2.2%	0.3%	11.6%	18.5%	0.0%	26.6%	0.4%	7.2%
1990	1390	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	23.5%	5.9%	0.0%	3.2%	0.2%	0.1%	0.0%	10.4%	0.0%	0.1%	2.0%	13.0%	0.0%	33.9%	0.0%	7.6%
1991	277	2,3,4,5	0.0%	0.0%	0.0%	2.2%	0.0%	9.0%	1.8%	0.0%	3.6%	0.0%	2.2%	0.0%	17.0%	0.0%	0.7%	6.1%	25.6%	0.0%	15.9%	0.0%	15.9%
1992	544	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.6%	6.6%	3.3%	0.0%	5.3%	0.0%	2.0%	0.0%	6.6%	0.0%	0.0%	11.4%	27.6%	0.0%	8.8%	0.0%	27.8%
1993	718	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	13.8%	1.7%	0.4%	4.5%	0.0%	2.8%	0.0%	2.9%	0.0%	0.7%	3.8%	20.2%	0.0%	20.9%	0.0%	28.4%
1994	1540	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	0.4%	0.0%	4.3%	0.0%	2.4%	0.0%	0.6%	0.0%	0.0%	4.9%	36.4%	0.0%	16.6%	0.4%	30.4%
1995	2033	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.4%	7.8%	2.9%	0.0%	2.1%	0.0%	0.6%	0.0%	2.4%	0.0%	0.0%	1.4%	27.7%	0.0%	29.4%	0.0%	25.3%
1996	1090	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.0%	0.6%	1.2%	0.0%	3.9%	0.0%	1.0%	0.0%	1.6%	0.0%	0.0%	1.5%	26.1%	0.0%	38.0%	0.0%	26.0%
1997	757	2,3,4,5	0.0%	0.5%	0.0%	0.0%	0.5%	3.2%	4.1%	0.0%	0.8%	0.0%	0.7%	0.0%	0.7%	0.0%	0.9%	0.8%	29.1%	0.0%	18.9%	1.5%	38.4%
1998	1549	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.4%	0.3%	0.6%	0.0%	2.3%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.5%	24.0%	0.0%	36.7%	0.8%	33.9%
1999	1682	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	2.6%	0.0%	3.4%	0.0%	0.0%	0.0%	3.1%	0.0%	0.3%	1.2%	23.5%	0.0%	41.1%	0.0%	24.4%
2000	740	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	13.4%	3.0%	0.0%	3.6%	0.0%	0.0%	0.0%	1.6%	0.0%	1.4%	2.2%	28.4%	0.0%	35.5%	0.0%	10.9%
2001	1200	2,3,4,5	0.3%	0.0%	0.0%	0.0%	0.0%	3.0%	2.8%	0.0%	1.8%	0.0%	0.0%	0.0%	4.3%	0.0%	0.4%	0.4%	25.9%	0.0%	26.8%	0.0%	34.3%
2002	1559	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	6.4%	3.5%	0.0%	1.1%	0.0%	0.0%	0.0%	3.6%	0.0%	0.6%	0.6%	12.3%	0.0%	40.7%	3.3%	28.0%
2003	1772	2,3,4,5	0.1%	0.0%	0.0%	0.0%	0.6%	5.1%	1.9%	0.0%	1.3%	0.0%	0.0%	0.0%	4.6%	0.0%	0.0%	0.4%	15.1%	0.0%	42.3%	1.9%	26.8%
2004	1896	2,3,4,5	0.0%	0.1%	0.0%	0.0%	0.0%	5.5%	1.2%	0.0%	1.5%	0.0%	0.0%	0.0%	7.1%	0.0%	0.6%	0.6%	12.5%	0.0%	32.6%	0.0%	38.3%
2005	1373	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	2.0%	0.0%	5.5%	0.0%	0.3%	0.0%	4.0%	0.0%	1.9%	0.7%	13.5%	0.0%	10.9%	0.0%	55.9%
2006	3228	2,3,4,5	0.1%	0.0%	0.0%	0.0%	0.0%	6.0%	1.7%	0.0%	2.4%	0.0%	0.0%	0.0%	5.6%	0.0%	0.3%	0.8%	8.4%	0.0%	40.7%	0.0%	34.0%
2007	3347	2,3,4,5	0.0%	0.0%	0.0%	0.1%	0.0%	9.7%	1.5%	0.0%	1.0%	0.0%	0.0%	0.0%	4.9%	0.0%	0.4%	0.8%	14.1%	0.0%	35.6%	0.0%	32.1%
2008	1169	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%	3.3%	0.0%	5.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.4%	0.8%	15.4%	0.0%	46.7%	0.0%	21.8%
2009	1777	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%	0.1%	0.8%	13.9%	0.0%	42.0%	0.0%	35.3%
2010	1944	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	1.6%	0.0%	0.2%	0.0%	0.0%	0.0%	4.1%	0.0%	0.4%	0.2%	1.7%	0.0%	41.2%	4.4%	41.7%
2011	1538	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.8%	1.6%	7.4%	0.0%	24.7%	3.4%	55.3%
1979-2011	1231		0.0%	0.0%	0.0%	0.2%	0.2%	8.5%	2.1%	0.2%	4.2%	0.2%	1.1%	0.0%	4.5%	0.1%	0.4%	4.1%	20.6%	0.0%	27.8%	0.6%	25.3%
1979-1984	276		0.0%	0.0%	0.0%	0.8%	0.0%	21.6%	0.0%	0.8%	4.3%	0.0%	3.3%	0.0%	2.1%	0.0%	0.0%	11.9%	40.2%	0.0%	12.1%	0.0%	2.9%
1985-1995	776		0.0%	0.0%	0.0%	0.3%	0.3%	11.8%	2.3%	0.4%	7.1%	0.4%	2.2%	0.0%	6.6%	0.2%	0.2%	7.4%	22.3%	0.0%	20.7%	0.3%	17.4%
1996-1998	1132		0.1%	0.2%	0.0%	0.0%	0.3%	1.4%	2.0%	0.0%	2.3%	0.0%	0.6%	0.0%	0.9%	0.0%	0.3%	0.9%	26.4%	0.0%	31.2%	0.7%	32.8%
1999-2011	1787		0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	2.3%	0.0%	2.1%	0.0%	0.0%	0.0%	3.9%	0.0%	0.6%	0.9%	14.8%	0.0%	35.5%	1.0%	33.7%

[1] Estimates for this year can only be used for distribution of fishing mortalities because the escapement data are insufficient.

Appendix C23. Percent distribution of Nooksack Spring Yearling (Nooksack Spring Yearling) total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM																
	# of		SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	45	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	226	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	201	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	255	2,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.8%	2.4%	15.7%	0.4%	4.3%	0.0%	0.4%	0.0%	0.0%	7.1%	3.5%	0.0%	0.0%	0.0%	63.5%
1987	558	3,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	562	2,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	128	2,3,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.3%	9.4%	0.0%	0.8%	0.0%	66.4%
1990	87	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	8.0%	1.1%	0.0%	39.1%	1.1%	10.3%	0.0%	1.1%	0.0%	0.0%	2.3%	23.0%	0.0%	0.0%	0.0%	13.8%
1991	383	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	6.0%	0.0%	43.6%	0.0%	6.0%	0.0%	2.1%	0.0%	0.0%	5.7%	6.3%	0.0%	1.3%	0.0%	26.9%
1992	1035	2,3,4,5	1.6%	1.9%	0.0%	0.0%	0.3%	18.8%	2.2%	1.6%	14.3%	1.0%	1.6%	0.0%	1.0%	0.0%	0.0%	0.4%	9.5%	0.0%	0.0%	0.0%	45.7%
1993	672	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	7.6%	3.3%	15.5%	0.0%	5.7%	0.0%	0.7%	0.0%	0.0%	5.1%	12.2%	0.0%	0.0%	0.0%	45.2%
1994	539	2,4,5	0.6%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	5.9%	30.6%	0.0%	1.1%	0.0%	0.2%	0.0%	0.0%	5.9%	3.9%	0.0%	0.0%	0.0%	46.8%
1995	197	2,3,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	26.4%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	3.0%	11.7%	0.0%	0.0%	0.0%	58.4%
1996	203	2,3,4	0.0%	0.0%	0.0%	0.0%	1.0%	0.5%	3.0%	0.0%	16.3%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	5.4%	0.0%	0.5%	0.0%	72.9%
1997	131	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	0.0%	16.8%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	3.1%	22.1%	0.0%	0.0%	0.0%	50.4%
1998	134	2,3,4,5	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	6.0%	0.0%	21.6%	0.0%	5.2%	0.0%	0.0%	0.0%	0.0%	1.5%	8.2%	0.0%	2.2%	0.0%	50.7%
1999	210	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	1.4%	0.0%	27.1%	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	1.4%	1.9%	0.0%	2.9%	0.0%	60.0%
2000	156	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	31	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2009	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2010	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979-2011	331		0.2%	0.2%	0.0%	0.0%	0.5%	3.6%	2.8%	1.1%	23.1%	0.2%	3.1%	0.0%	0.7%	0.0%	0.0%	4.1%	9.8%	0.0%	0.6%	0.0%	50.1%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	412		0.3%	0.2%	0.0%	0.0%	0.0%	5.1%	2.2%	1.7%	24.4%	0.3%	3.7%	0.0%	0.7%	0.0%	0.0%	5.4%	9.9%	0.0%	0.3%	0.0%	45.8%
1996-1998	156		0.0%	0.0%	0.0%	0.0%	1.8%	0.2%	4.8%	0.0%	18.2%	0.0%	2.5%	0.0%	0.2%	0.0%	0.0%	1.5%	11.9%	0.0%	0.9%	0.0%	58.0%
1999-2011	210		0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	1.4%	0.0%	27.1%	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	1.4%	1.9%	0.0%	2.9%	0.0%	60.0%

Appendix C24. Percent distribution of Nooksack Spring Fingerling (Nooksack Spring Yearling) total fishing mortalities among fisheries and escapement.

Catch	Estimated		AABM							ISBM													
	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	11	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	195	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	512	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	367	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	67	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	503	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	1134	2,3,4	3.3%	0.0%	0.2%	0.0%	1.1%	1.1%	4.0%	0.0%	20.7%	0.0%	5.7%	0.0%	0.7%	0.0%	0.0%	0.2%	9.3%	0.0%	0.1%	0.0%	53.7%
1997	2078	2,3,4,5	4.0%	0.4%	0.8%	0.3%	0.1%	2.2%	2.9%	0.0%	11.5%	0.8%	1.3%	0.0%	0.5%	0.0%	0.0%	0.4%	6.5%	0.0%	0.8%	0.0%	67.4%
1998	1526	2,3,4,5	8.8%	0.2%	0.0%	0.0%	0.0%	1.8%	3.5%	0.0%	3.8%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.1%	1.1%	0.0%	0.0%	0.0%	80.2%
1999	1660	2,3,4,5	2.0%	0.2%	0.0%	0.0%	1.0%	2.5%	5.8%	0.0%	4.6%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	81.2%
2000	946	2,3,4,5	5.1%	0.3%	0.0%	0.0%	0.0%	20.6%	5.0%	0.0%	15.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%	0.6%	0.0%	0.0%	0.0%	52.9%
2001	1411	2,3,4,5	1.9%	0.0%	0.0%	0.0%	0.0%	10.9%	4.9%	0.0%	5.3%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.5%	1.6%	0.0%	0.3%	0.0%	73.4%
2002	1270	2,3,4,5	6.3%	0.0%	0.6%	0.9%	1.4%	17.0%	2.4%	0.0%	1.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.5%	0.2%	0.7%	0.0%	0.0%	0.0%	68.3%
2003	782	2,3,4,5	3.7%	0.0%	0.0%	0.0%	0.6%	13.6%	2.9%	0.0%	7.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	3.3%	0.0%	0.9%	0.0%	66.6%
2004	695	2,3,4,5	1.6%	0.0%	0.0%	0.3%	0.0%	31.5%	5.3%	0.0%	11.2%	0.0%	0.0%	0.0%	3.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.4%	0.0%	45.0%
2005	857	2,3,4,5	3.6%	0.2%	0.0%	0.2%	0.0%	32.6%	4.3%	0.0%	8.8%	0.0%	0.5%	0.0%	0.5%	0.0%	0.2%	0.0%	1.1%	0.0%	0.8%	0.0%	47.3%
2006	567	2,3,4,5	2.3%	0.0%	0.5%	1.2%	0.0%	31.6%	6.7%	0.0%	9.7%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.2%	3.7%	0.0%	2.3%	0.7%	39.9%
2007	612	2,3,4,5	5.4%	0.2%	0.5%	0.3%	0.0%	24.3%	9.5%	0.0%	11.3%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.0%	6.0%	0.0%	0.7%	0.3%	41.0%
2008	1070	2,3,4,5	1.4%	0.2%	0.0%	0.4%	0.0%	19.8%	13.5%	0.0%	16.2%	0.0%	0.0%	0.0%	1.3%	0.0%	0.5%	0.4%	7.1%	0.0%	1.7%	0.2%	37.5%
2009	838	2,3,4,5	3.3%	0.6%	0.0%	0.0%	0.0%	7.4%	10.9%	0.0%	16.1%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	4.5%	0.0%	1.4%	0.0%	54.9%
2010	851	2,3,4,5	3.6%	0.4%	0.0%	0.8%	1.6%	21.7%	10.9%	0.0%	2.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.5%	0.2%	3.6%	0.0%	0.5%	0.0%	51.6%
2011	511	2,3,4,5	3.5%	0.0%	0.0%	0.0%	0.4%	15.5%	5.7%	0.0%	17.2%	0.0%	0.4%	0.0%	1.2%	0.0%	0.0%	0.0%	4.1%	0.0%	2.5%	0.0%	49.5%
1979-2011	1050		3.7%	0.2%	0.2%	0.3%	0.4%	15.9%	6.1%	0.0%	10.2%	0.1%	0.5%	0.0%	1.0%	0.0%	0.1%	0.2%	3.5%	0.0%	0.8%	0.1%	56.9%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1996-1998	1579		5.4%	0.2%	0.3%	0.1%	0.4%	1.7%	3.5%	0.0%	12.0%	0.3%	2.4%	0.0%	0.5%	0.0%	0.0%	0.2%	5.6%	0.0%	0.3%	0.0%	67.1%
1999-2011	928		3.4%	0.2%	0.1%	0.3%	0.4%	19.2%	6.7%	0.0%	9.8%	0.0%	0.1%	0.0%	1.1%	0.0%	0.1%	0.2%	3.0%	0.0%	0.9%	0.1%	54.5%

Appendix C25. Percent distribution of Puntledge River Summer (Lower Strait of Georgia Hatchery) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	1539	2,3,4	1.9%	0.3%	0.3%	2.7%	0.4%	1.0%	0.0%	19.8%	17.2%	8.6%	12.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	35.3%
1980	817	2,3,4,5	2.6%	0.0%	0.5%	2.2%	1.5%	5.8%	0.0%	16.3%	23.3%	6.4%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	31.2%
1981	541	2,3,4,5	0.9%	0.0%	0.0%	5.0%	4.3%	0.0%	0.0%	21.6%	37.5%	7.9%	8.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.0%
1982	561	2,3,4,5	1.1%	0.5%	0.0%	4.1%	1.6%	2.1%	0.0%	5.7%	15.7%	16.0%	23.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	30.1%
1983	531	2,3,4,5	2.1%	0.2%	0.0%	8.5%	3.0%	2.6%	0.0%	12.6%	13.4%	17.3%	7.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.4%
1984	317	2,3,4,5	0.0%	0.9%	0.0%	2.2%	1.3%	2.2%	0.0%	5.7%	18.9%	5.7%	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.1%
1985	156	2,3,4,5	13.5%	1.3%	3.8%	6.4%	6.4%	0.0%	0.0%	0.0%	31.4%	1.3%	13.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.4%
1986	204	2,3,4,5	5.9%	0.0%	5.4%	2.9%	0.0%	2.9%	0.0%	12.3%	31.9%	4.4%	11.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.0%
1987	162	2,3,4,5	3.1%	1.2%	0.0%	15.4%	10.5%	0.0%	4.3%	0.0%	16.7%	2.5%	6.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.1%
1988	108	2,3,4,5	11.1%	0.0%	0.0%	0.0%	14.8%	0.0%	0.0%	0.0%	25.0%	0.0%	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	43.5%
1989	75	2,3,4,5	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.0%
1990	103	2,3,4,5	9.7%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	9.7%	3.9%	15.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.3%
1991	131	2,3,4,5	6.1%	7.6%	0.0%	0.0%	9.9%	0.0%	0.0%	0.0%	36.6%	0.0%	9.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	29.8%
1992	103	2,3,4,5	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	3.9%	40.8%	0.0%	19.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.0%
1993	82	2,3,4,5	0.0%	0.0%	0.0%	0.0%	9.8%	0.0%	0.0%	0.0%	56.1%	0.0%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.0%
1994	34	2,3,4,5	8.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	58.8%	0.0%	8.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.5%
1995	57	2,3,4,5	3.5%	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.9%	0.0%	10.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	29.8%
1996	51	2,3,4,5	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%	37.3%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	54.9%
1997	28	3,4,5	0.0%	0.0%	0.0%	0.0%	10.7%	0.0%	0.0%	0.0%	7.1%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%
1998	12	2,4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	50	2,3,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%	0.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.0%
2000	64	2,3,4	1.6%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	84.4%
2001	215	2,3,4,5	3.3%	0.5%	0.0%	0.0%	1.4%	2.3%	0.0%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	89.3%
2002	123	2,3,4,5	5.7%	0.0%	0.0%	0.0%	11.4%	0.0%	11.4%	0.0%	4.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	66.7%
2003	114	2,3,4,5	0.0%	0.0%	0.0%	0.0%	11.4%	0.0%	0.0%	0.0%	7.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.7%
2004	108	2,3,4,5	16.7%	0.9%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	13.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	66.7%
2005	335	2,3,4,5	1.8%	0.0%	0.0%	1.5%	11.3%	0.6%	0.0%	0.0%	15.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	69.0%
2006	226	2,3,4,5	10.6%	3.1%	0.0%	1.3%	3.5%	0.0%	2.2%	0.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.2%
2007	207	2,3,4,5	21.3%	16.4%	2.9%	1.4%	7.2%	0.0%	0.0%	0.0%	1.9%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	48.3%
2008	133	2,3,4,5	3.0%	2.3%	0.0%	0.0%	6.8%	0.0%	9.8%	0.0%	23.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	54.9%
2009	613	2,3,4,5	5.5%	1.8%	0.2%	1.1%	4.9%	0.0%	0.0%	0.0%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	76.0%
2010	502	2,3,4,5	7.4%	1.0%	0.0%	0.0%	11.6%	1.6%	1.2%	0.0%	6.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	70.7%
2011	341	2,3,4,5	6.7%	4.4%	0.3%	1.5%	14.1%	0.0%	0.0%	0.0%	7.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.1%
2012	105	2,3,4,5	21.9%	0.0%	0.0%	0.0%	23.8%	0.0%	5.7%	0.0%	31.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.1%
1979-2012	265		5.4%	1.5%	0.4%	1.7%	5.9%	0.7%	1.0%	3.0%	22.5%	2.2%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	49.8%
1979-1984	718		1.4%	0.3%	0.1%	4.1%	2.0%	2.3%	0.0%	13.6%	21.0%	10.3%	11.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.4%
1985-1995	110		5.9%	1.4%	0.8%	2.3%	5.4%	0.3%	0.4%	1.5%	37.7%	1.1%	9.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.6%
1996-1998	40		0.0%	0.0%	0.0%	0.0%	8.3%	0.0%	0.0%	0.0%	22.2%	0.0%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.0%
1999-2012	224		7.5%	2.3%	0.2%	0.5%	7.7%	0.5%	2.2%	0.0%	11.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	67.4%

Appendix C26. Percent distribution of Quinsam River Fall (Upper Strait of Georgia) total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	1686	2,3,4,5	6.5%	4.4%	1.1%	6.2%	3.3%	0.1%	0.0%	2.4%	4.2%	10.9%	22.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.3%
1980	1703	2,3,4,5,6	15.3%	4.8%	3.2%	10.5%	5.6%	0.0%	0.0%	1.5%	5.0%	16.6%	21.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.1%
1981	1712	2,3,4,5,6	11.7%	4.4%	1.8%	13.1%	5.7%	0.6%	0.0%	2.1%	9.8%	12.3%	16.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	21.9%
1982	1263	2,3,4,5,6	19.6%	6.4%	5.4%	8.5%	2.3%	0.3%	0.0%	0.0%	3.6%	6.4%	26.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	21.5%
1983	1332	2,3,4,5,6	25.3%	1.2%	0.3%	14.4%	2.9%	0.7%	0.0%	0.2%	4.4%	11.5%	24.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.0%
1984	1278	2,3,4,5,6	17.1%	4.6%	5.6%	6.5%	4.1%	0.9%	0.0%	0.9%	6.7%	5.0%	20.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	27.9%
1985	1791	2,3,4,5,6	28.3%	8.5%	4.4%	4.9%	1.0%	0.1%	0.0%	0.0%	4.0%	3.5%	18.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	27.2%
1986	1915	2,3,4,5,6	15.2%	10.1%	3.1%	6.6%	3.1%	0.0%	0.0%	0.2%	5.7%	7.3%	24.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.4%
1987	1624	2,3,4,5,6	15.3%	8.6%	2.8%	7.0%	5.9%	0.4%	0.3%	0.2%	3.4%	6.9%	20.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.3%
1988	1712	2,3,4,5,6	19.4%	4.9%	1.3%	6.8%	3.0%	0.8%	0.9%	0.2%	4.0%	2.6%	9.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	46.7%
1989	1927	2,3,4,5,6	13.9%	9.1%	2.8%	4.0%	3.1%	0.3%	0.0%	0.0%	7.8%	2.0%	16.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	40.7%
1990	1300	2,3,4,5,6	17.2%	5.5%	0.5%	6.8%	8.8%	1.4%	0.0%	1.6%	2.0%	4.9%	13.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	37.5%
1991	852	2,3,4,5,6	11.6%	5.8%	1.5%	6.3%	11.0%	0.6%	0.7%	0.7%	4.2%	10.1%	13.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	34.3%
1992	688	2,3,4,5,6	15.1%	2.6%	2.6%	11.0%	6.4%	0.3%	0.0%	0.4%	3.5%	9.9%	9.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.2%
1993	395	2,3,4,5,6	8.4%	6.3%	1.3%	6.3%	7.8%	1.3%	0.0%	1.0%	12.2%	6.6%	20.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.4%
1994	603	2,3,4,5,6	3.8%	49.6%	2.3%	5.8%	1.8%	0.0%	0.0%	0.0%	3.8%	0.8%	9.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.7%
1995	308	2,3,4,5,6	7.5%	13.3%	0.0%	10.7%	6.5%	0.0%	0.0%	0.0%	7.8%	0.0%	16.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	37.7%
1996	295	2,3,4,5,6	7.1%	1.4%	0.0%	1.4%	4.1%	0.0%	0.0%	0.0%	8.5%	0.0%	19.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	58.3%
1997	478	2,3,4,5,6	11.3%	5.0%	3.1%	3.6%	7.9%	0.4%	5.0%	0.0%	10.9%	2.5%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	47.1%
1998	616	2,3,4,5,6	15.1%	4.1%	2.3%	0.0%	10.1%	0.0%	0.0%	0.0%	7.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	60.6%
1999	1009	2,3,4,5,6	9.4%	4.2%	4.9%	2.2%	20.6%	0.0%	0.0%	0.0%	1.8%	0.4%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	55.4%
2000	850	2,3,4,5,6	14.1%	3.4%	5.5%	0.4%	6.1%	0.0%	0.0%	0.0%	3.4%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	65.4%
2001	1280	2,3,4,5,6	10.7%	2.5%	2.0%	0.1%	5.3%	0.0%	0.0%	0.0%	2.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	76.8%
2002	947	2,3,4,5,6	15.7%	3.7%	1.0%	0.6%	13.6%	0.0%	0.0%	0.0%	2.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	62.7%
2003	543	2,3,4,5,6	19.9%	2.2%	0.9%	0.0%	23.9%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	52.7%
2004	845	2,3,4,5,6	8.3%	19.4%	1.8%	0.2%	17.4%	0.0%	0.0%	0.0%	0.8%	0.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	49.8%
2005	911	2,3,4,5,6	17.1%	2.2%	3.1%	0.4%	17.7%	0.0%	0.0%	0.0%	1.5%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	56.8%
2006	837	2,3,4,5,6	17.3%	5.1%	1.3%	0.7%	8.7%	0.0%	0.8%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	61.2%
2007	637	2,3,4,5,6	20.6%	5.3%	1.1%	3.1%	14.1%	0.0%	0.0%	0.0%	6.9%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	47.9%
2008	411	2,3,4,5,6	12.4%	2.4%	0.2%	0.7%	8.3%	0.0%	0.0%	0.0%	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	71.5%
2009	454	2,3,4,5,6	12.6%	4.4%	2.4%	0.9%	13.0%	0.0%	1.5%	0.0%	10.6%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.1%
2010	653	2,3,4,5,6	5.7%	5.5%	0.8%	0.0%	14.2%	0.0%	0.0%	0.0%	10.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	62.5%
2011	805	2,3,4,5,6	10.8%	8.6%	0.6%	0.0%	18.4%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.2%
2012	818	2,3,4,5,6	17.5%	8.1%	2.1%	0.9%	14.4%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	54.3%
1979-2012	1014		14.0%	7.0%	2.2%	4.4%	8.8%	0.2%	0.3%	0.3%	5.1%	3.5%	9.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	44.2%
1979-1984	1496		15.9%	4.3%	2.9%	9.9%	4.0%	0.4%	0.0%	1.2%	5.6%	10.4%	21.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.5%
1985-1995	1192		14.1%	11.3%	2.1%	6.9%	5.3%	0.5%	0.2%	0.4%	5.3%	5.0%	15.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%
1996-1998	463		11.2%	3.5%	1.8%	1.6%	7.4%	0.1%	1.7%	0.0%	8.8%	0.8%	7.6%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	55.3%
1999-2012	786		13.7%	5.5%	2.0%	0.7%	14.0%	0.0%	0.2%	0.0%	3.8%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	59.3%

Appendix C27. Percent distribution of Queets Fall Fingerling (Washington Coastal Wild) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	2	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	14	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	110	2,3,4	12.7%	0.0%	0.0%	16.4%	0.0%	11.8%	0.0%	0.0%	0.0%	1.8%	2.7%	0.0%	1.8%	0.0%	0.0%	0.0%	3.6%	0.0%	28.2%	0.0%	20.9%
1982	240	2,3,4,5	15.0%	1.7%	0.0%	18.8%	1.3%	12.9%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	26.3%	0.0%	23.3%
1983	196	2,3,4,5,6	45.4%	0.0%	0.0%	13.3%	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	0.5%	0.0%	0.0%	1.5%	0.0%	0.0%	16.8%	0.0%	15.3%
1984	149	2,3,4,5,6	16.8%	0.7%	0.0%	20.1%	2.0%	8.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	28.2%	0.0%	22.1%
1985	286	2,3,4,5,6	20.3%	0.0%	0.0%	32.2%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	12.9%	0.0%	29.4%
1986	328	3,4,5,6	25.3%	0.0%	1.2%	11.3%	0.0%	7.0%	0.0%	0.0%	0.0%	1.5%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.1%	0.0%	43.6%
1987	618	2,4,5,6	28.0%	1.8%	0.0%	11.7%	1.0%	1.5%	0.0%	0.0%	0.0%	0.8%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.8%	0.0%	19.9%	0.0%	33.7%
1988	828	2,3,5,6	17.9%	1.7%	1.6%	9.4%	0.2%	5.6%	1.0%	0.0%	0.0%	2.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	15.0%	0.0%	41.5%
1989	661	2,3,4,6	16.6%	0.3%	0.2%	10.6%	1.1%	8.9%	0.0%	0.0%	0.0%	0.6%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	24.4%	0.0%	35.4%
1990	1366	2,3,4,5	15.1%	0.7%	0.1%	6.4%	2.4%	7.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	0.0%	54.5%
1991	1203	2,3,4,5,6	24.4%	0.3%	1.2%	10.1%	1.4%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	14.6%	0.0%	42.4%
1992	777	2,3,4,5,6	13.8%	5.8%	2.3%	8.5%	1.8%	17.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	16.0%	0.0%	33.8%
1993	715	2,3,4,5,6	18.9%	2.2%	0.7%	15.0%	2.0%	13.3%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.4%	0.0%	1.8%	0.0%	1.0%	0.0%	14.0%	0.0%	30.5%
1994	1219	2,3,4,5,6	23.5%	1.3%	0.4%	21.2%	1.4%	4.0%	1.0%	0.0%	0.2%	0.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.6%	0.0%	27.9%
1995	836	2,3,4,5,6	22.1%	0.0%	1.8%	7.4%	3.8%	0.8%	0.4%	0.0%	0.2%	0.0%	0.2%	0.0%	0.7%	0.0%	0.0%	0.4%	0.0%	0.0%	29.8%	0.0%	32.3%
1996	804	2,3,4,5,6	18.0%	0.0%	1.5%	1.1%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.9%	0.5%	62.3%
1997	946	2,3,4,5,6	37.3%	0.6%	0.0%	5.5%	0.0%	0.3%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.1%	0.0%	35.6%
1998	673	2,3,4,5,6	25.4%	0.0%	3.1%	19.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	11.6%	4.5%	35.1%
1999	821	2,3,4,5,6	12.9%	0.0%	1.7%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	8.3%	0.0%	70.2%
2000	496	2,3,4,5,6	26.0%	0.0%	12.1%	13.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	44.8%
2001	501	2,3,4,5,6	28.3%	0.0%	6.8%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.6%	0.0%	0.0%	0.0%	38.1%	0.0%	20.0%
2002	1784	2,3,4,5,6	29.3%	0.0%	3.6%	5.1%	2.9%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	23.2%	0.0%	35.4%
2003	1577	2,3,4,5,6	22.8%	0.1%	3.9%	11.9%	5.8%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	19.9%	0.0%	34.6%
2004	2767	2,3,4,5,6	17.3%	1.0%	3.2%	7.2%	8.3%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	11.1%	0.0%	49.8%
2005	2626	2,3,4,5,6	15.8%	0.0%	3.5%	7.2%	3.1%	3.5%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.1%	0.0%	0.5%	0.0%	0.0%	0.0%	19.4%	0.0%	46.5%
2006	1168	2,3,4,5,6	26.2%	0.2%	2.9%	13.7%	3.8%	4.1%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.2%	0.0%	0.0%	0.0%	16.1%	0.0%	31.7%
2007	712	2,3,4,5,6	32.3%	0.0%	4.5%	11.2%	15.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.3%	0.1%	0.0%	0.0%	0.0%	14.2%	0.0%	19.4%
2008	1084	2,3,4,5,6	17.0%	0.0%	1.3%	7.9%	4.8%	0.7%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.3%	0.0%	47.0%
2009	1711	2,3,4,5,6	25.8%	1.6%	3.0%	9.2%	3.2%	0.1%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.7%	0.0%	40.3%
2010	2043	2,3,4,5,6	25.0%	0.0%	4.9%	5.2%	5.5%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	0.0%	19.4%	0.0%	38.8%
2011	2012	3,4,5,6	28.1%	0.2%	4.2%	7.5%	6.4%	0.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	16.8%	0.0%	35.9%
1979-2011	1008		22.7%	0.7%	2.2%	11.3%	2.5%	3.9%	0.2%	0.0%	0.0%	0.3%	0.3%	0.0%	0.3%	0.0%	0.2%	0.1%	0.4%	0.0%	18.1%	0.2%	36.6%
1979-1984	174		22.5%	0.6%	0.0%	17.1%	0.8%	9.5%	0.0%	0.0%	0.0%	0.5%	1.3%	0.0%	1.1%	0.0%	0.0%	0.5%	0.9%	0.0%	24.9%	0.0%	20.4%
1985-1995	803		20.5%	1.3%	0.9%	13.1%	1.4%	6.6%	0.2%	0.0%	0.0%	0.6%	0.4%	0.0%	0.1%	0.0%	0.2%	0.0%	0.8%	0.0%	17.0%	0.0%	36.8%
1996-1998	808		26.9%	0.2%	1.5%	8.7%	0.0%	0.3%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	15.9%	1.7%	44.3%
1999-2011	1485		23.6%	0.2%	4.3%	8.6%	4.5%	0.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	17.4%	0.0%	39.6%

Appendix C28. Percent distribution of Robertson Creek Fall (WCVI Hatchery and Natural) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM													
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	5485	2,3,4,5	21.5%	0.6%	0.7%	11.9%	0.3%	8.3%	0.1%	0.5%	1.1%	11.2%	9.4%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	4.9%	29.2%
1980	5100	2,3,4,5	28.1%	6.3%	1.1%	8.5%	0.1%	7.3%	0.5%	0.0%	0.1%	8.6%	5.8%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	9.5%	3.0%	20.9%
1981	3127	2,3,4,5	31.8%	1.8%	1.0%	13.8%	0.6%	5.8%	0.5%	0.4%	0.7%	8.2%	5.8%	0.0%	0.0%	0.0%	0.0%	1.3%	0.1%	0.0%	10.3%	4.5%	13.5%
1982	4734	2,3,4,5	29.1%	3.7%	1.6%	14.6%	0.1%	6.0%	0.3%	0.1%	0.7%	7.0%	5.8%	0.0%	0.0%	0.0%	0.0%	0.7%	0.1%	0.0%	12.5%	5.8%	11.7%
1983	4108	2,3,4,5	41.5%	2.8%	0.4%	11.0%	0.2%	5.6%	0.0%	0.0%	0.2%	7.9%	2.9%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	14.8%	4.7%	7.7%
1984	3320	2,3,4,5	30.1%	4.3%	0.1%	13.7%	0.0%	6.6%	0.0%	0.0%	1.0%	3.9%	3.5%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	14.9%	14.6%	7.1%
1985	1700	2,3,4,5	19.8%	13.8%	0.0%	15.9%	0.0%	1.4%	0.0%	0.0%	0.6%	0.9%	5.6%	0.0%	0.0%	0.0%	0.0%	1.4%	0.2%	0.0%	1.1%	15.2%	24.1%
1986	919	2,3,4,5	15.8%	8.5%	0.5%	8.1%	0.8%	6.0%	0.7%	0.0%	0.5%	0.9%	3.9%	0.0%	0.0%	0.0%	0.0%	0.3%	1.4%	0.0%	0.3%	28.0%	24.4%
1987	1625	2,3,4,5	10.5%	3.3%	1.0%	7.4%	0.6%	2.6%	0.2%	0.0%	0.5%	3.4%	3.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	19.4%	47.4%
1988	3135	2,3,4,5	11.4%	4.4%	1.3%	7.7%	1.0%	4.9%	4.6%	0.0%	1.0%	1.4%	2.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.3%	0.0%	6.6%	12.8%	40.2%
1989	6705	2,3,4,5	10.0%	8.2%	0.4%	9.4%	0.7%	2.5%	1.8%	0.0%	1.2%	1.6%	2.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	16.2%	16.4%	29.5%
1990	11203	2,3,4,5	19.0%	2.5%	2.0%	9.1%	1.0%	6.2%	1.4%	0.0%	0.3%	2.3%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	7.4%	8.1%	38.4%
1991	13871	2,3,4,5	19.5%	2.5%	3.2%	9.7%	0.9%	4.9%	1.3%	0.0%	0.4%	2.6%	1.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	14.2%	12.7%	26.8%
1992	11417	2,3,4,5	15.3%	16.1%	1.6%	6.8%	1.3%	17.0%	1.9%	0.0%	0.1%	2.8%	1.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.3%	4.9%	30.7%
1993	6717	2,3,4,5	15.9%	2.2%	2.4%	7.7%	1.3%	14.6%	2.4%	0.0%	0.5%	2.1%	1.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	6.8%	12.4%	30.3%
1994	3820	2,3,4,5	17.8%	6.8%	3.9%	9.2%	0.8%	4.9%	3.8%	0.0%	0.4%	1.2%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	11.1%	15.8%	23.2%
1995	1383	2,3,4,5	16.6%	0.0%	4.7%	3.3%	2.1%	1.7%	3.0%	0.0%	1.7%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	6.4%	9.8%	49.5%
1996	803	2,3,4,5	9.1%	0.1%	4.5%	2.7%	2.4%	0.7%	0.0%	0.0%	3.4%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	74.5%
1997	2268	2,3,4,5	15.2%	4.1%	4.6%	4.9%	3.4%	0.1%	1.8%	0.0%	0.6%	1.8%	0.6%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	17.0%	40.0%
1998	3325	2,3,4,5	16.5%	2.0%	5.0%	5.4%	3.4%	0.0%	4.7%	0.0%	0.6%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	16.3%	42.1%
1999	1269	2,3,4,5	12.1%	1.3%	7.5%	5.4%	7.2%	0.0%	3.3%	0.0%	0.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.1%	18.1%	37.9%
2000	258	2,3,4,5	6.6%	0.0%	0.0%	0.0%	6.2%	0.0%	0.0%	0.0%	7.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	79.8%
2001	969	2,3,4,5	4.2%	0.0%	3.0%	0.0%	0.6%	0.0%	2.4%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	83.8%
2002	2059	2,3,4,5	13.2%	0.6%	1.8%	3.9%	4.5%	0.3%	3.1%	0.0%	0.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	15.3%	49.0%
2003	2998	2,3,4,5	14.0%	2.2%	3.5%	0.8%	5.3%	0.0%	2.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.2%	15.2%	48.4%
2004	5078	2,3,4,5	13.2%	8.4%	2.9%	2.7%	5.9%	0.1%	1.4%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	11.2%	13.3%	39.2%
2005	3301	2,3,4,5	14.8%	1.9%	4.1%	3.0%	12.1%	0.0%	1.8%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	29.5%	8.2%	23.8%
2006	2852	2,3,4,5	11.7%	2.7%	2.7%	2.6%	6.1%	0.0%	3.8%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.7%	11.2%	33.0%
2007	2284	2,3,4,5	16.8%	3.4%	3.7%	5.3%	7.9%	0.1%	4.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.4%	12.5%	19.9%
2008	1606	2,3,4,5	10.0%	0.5%	1.6%	2.6%	6.2%	0.0%	1.3%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.2%	13.3%	42.3%
2009	1469	2,3,4,5	13.1%	5.9%	2.8%	2.1%	12.5%	0.0%	4.3%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.2%	12.7%	37.3%
2010	1317	2,3,4,5	7.8%	0.2%	4.3%	3.3%	10.6%	0.7%	2.7%	0.0%	1.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	4.4%	3.3%	61.4%
2011	2232	2,3,4,5	14.9%	2.5%	1.6%	3.7%	9.5%	0.2%	5.5%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	9.8%	17.5%	32.1%
2012	1947	2,3,4,5	14.0%	5.4%	1.3%	2.7%	7.2%	0.2%	4.5%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.9%	15.9%	31.1%
1979-2012	3659		16.5%	3.8%	2.4%	6.4%	3.6%	3.2%	2.0%	0.0%	1.3%	2.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	9.1%	11.4%	36.2%
1979-1984	4312		30.3%	3.3%	0.8%	12.2%	0.2%	6.6%	0.2%	0.2%	0.6%	7.8%	5.5%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	10.3%	6.3%	15.0%
1985-1995	5681		15.6%	6.2%	1.9%	8.6%	0.9%	6.1%	1.9%	0.0%	0.7%	1.8%	2.2%	0.0%	0.0%	0.0%	0.0%	0.3%	0.2%	0.0%	6.4%	14.1%	33.1%
1996-1998	2132		13.6%	2.1%	4.7%	4.3%	3.1%	0.3%	2.2%	0.0%	1.5%	0.8%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	11.8%	52.2%
1999-2012	2117		11.9%	2.6%	2.9%	2.7%	7.3%	0.1%	2.9%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	12.0%	11.3%	44.2%

Appendix C29. Percent distribution of Samish Fall Fingerling (Nooksack Fall Fingerling) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	SEAK Net	SEAK Sport	NBC Troll	NBC Sport	WCVI Troll	WCVI Sport	ISBM Geo St Troll	Geo St Sport	Canada Troll	Canada Net	Canada Sport	WA/OR coast Troll	WA/OR coast Net	WA/OR coast Sport	Puget Sound Net	Puget Sound Sport	Terminal Troll	Terminal Net	Terminal Sport	Esc.
1979	1964	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	83	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	1513	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	5385	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	6364	4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	369	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	75	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	1014	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	2075	2,3,4	0.2%	0.0%	0.0%	0.2%	0.2%	9.0%	1.8%	1.3%	18.3%	0.2%	3.3%	0.0%	7.9%	0.0%	0.0%	32.6%	11.0%	0.0%	0.0%	0.0%	14.1%
1990	2558	2,3,4,5	2.2%	0.0%	0.0%	0.6%	0.0%	20.1%	2.0%	3.5%	10.5%	0.1%	1.5%	0.0%	9.4%	0.0%	0.1%	27.2%	8.1%	0.0%	0.3%	0.0%	14.3%
1991	1047	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	14.2%	3.3%	1.9%	10.9%	0.1%	2.9%	0.0%	9.3%	0.0%	0.8%	20.1%	10.0%	0.0%	1.3%	1.3%	23.9%
1992	776	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.6%	10.8%	0.8%	2.3%	18.2%	0.0%	1.8%	0.0%	9.3%	0.0%	0.6%	13.3%	21.3%	0.0%	0.0%	0.6%	20.4%
1993	1248	2,3,4,5	0.0%	0.0%	0.0%	0.3%	0.2%	13.5%	7.9%	3.7%	19.6%	0.2%	2.4%	0.0%	4.0%	0.0%	0.1%	15.0%	13.5%	0.0%	0.0%	0.0%	19.7%
1994	1048	2,3,4,5	0.5%	0.0%	0.0%	0.5%	0.0%	13.1%	5.4%	1.3%	14.7%	0.0%	2.4%	0.0%	2.1%	0.0%	0.0%	36.5%	4.1%	0.0%	0.0%	0.5%	19.0%
1995	838	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.0%	7.2%	3.1%	0.0%	6.7%	0.0%	1.6%	0.0%	3.0%	0.0%	0.0%	23.9%	20.4%	0.0%	0.0%	2.3%	31.7%
1996	1420	2,3,4,5	0.0%	0.1%	0.0%	0.1%	0.0%	0.9%	0.6%	0.0%	14.7%	0.0%	0.5%	0.0%	1.5%	0.0%	0.0%	31.5%	13.9%	0.0%	0.0%	14.2%	22.0%
1997	1410	2,3,4,5	0.8%	0.1%	0.0%	0.2%	0.1%	2.6%	1.7%	0.0%	9.6%	0.6%	1.2%	0.0%	0.9%	0.0%	0.1%	33.6%	11.4%	0.0%	0.0%	0.4%	36.6%
1998	739	2,3,4,5	3.4%	0.0%	0.0%	0.0%	0.0%	1.6%	3.2%	0.0%	12.2%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	42.4%	4.9%	0.0%	0.0%	0.7%	31.0%
1999	283	2,3,4,5	4.2%	0.0%	0.0%	2.1%	3.5%	1.4%	10.2%	0.0%	13.8%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	35.3%	5.7%	0.0%	0.0%	0.0%	21.9%
2000	383	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	9.9%	9.1%	0.0%	16.7%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	35.2%	6.0%	0.0%	0.0%	0.0%	22.7%
2001	1745	2,3,4,5	0.0%	0.3%	0.0%	0.0%	0.1%	4.9%	5.3%	0.0%	9.6%	0.0%	0.5%	0.0%	2.6%	0.0%	0.1%	37.3%	7.9%	0.0%	0.5%	0.0%	31.0%
2002	1624	2,3,4,5	0.9%	0.0%	0.0%	0.7%	0.0%	8.2%	7.2%	0.0%	7.8%	0.0%	0.0%	0.0%	3.0%	0.0%	0.6%	35.5%	6.2%	0.0%	0.3%	0.0%	29.7%
2003	769	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.0%	13.4%	3.1%	0.0%	6.2%	0.0%	0.3%	0.0%	6.6%	0.0%	0.5%	37.3%	3.1%	0.0%	0.3%	0.0%	28.2%
2004	565	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	7.6%	6.5%	0.0%	6.5%	0.0%	0.0%	0.0%	11.7%	0.0%	0.4%	28.0%	8.7%	0.0%	1.8%	0.0%	28.3%
2005	784	2,3,4,5	0.4%	0.1%	0.0%	0.4%	0.0%	10.3%	7.5%	0.0%	18.8%	0.0%	0.0%	0.0%	7.1%	0.0%	0.8%	29.6%	6.9%	0.0%	0.8%	0.0%	17.3%
2006	1624	2,3,4,5	1.0%	0.1%	0.0%	0.2%	0.0%	7.8%	5.5%	0.0%	6.8%	0.0%	0.0%	0.0%	6.8%	0.0%	1.2%	49.6%	7.3%	0.0%	0.5%	0.0%	13.3%
2007	2250	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	8.7%	4.4%	0.0%	7.8%	0.0%	0.0%	0.0%	2.7%	0.0%	0.4%	29.4%	6.1%	0.0%	0.5%	21.2%	18.4%
2008	1803	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.0%	6.1%	4.9%	0.0%	7.1%	0.0%	0.0%	0.0%	4.3%	0.0%	0.3%	41.7%	11.1%	0.0%	0.3%	0.0%	24.0%
2009	1719	2,3,4,5	0.0%	0.1%	0.0%	0.0%	0.0%	3.1%	5.5%	0.0%	5.1%	0.0%	0.0%	0.0%	3.4%	0.0%	0.3%	31.7%	13.5%	0.0%	0.6%	0.0%	36.7%
2010	1827	2,3,4,5	0.0%	0.0%	0.1%	0.0%	0.6%	7.1%	6.7%	0.0%	5.4%	0.0%	0.0%	0.0%	10.5%	0.0%	0.7%	30.6%	9.9%	0.0%	0.8%	0.0%	27.8%
2011	1555	2,3,4,5	0.1%	0.0%	0.0%	0.0%	0.8%	4.4%	4.5%	0.0%	13.6%	0.0%	0.0%	0.0%	2.7%	0.0%	0.3%	35.2%	10.7%	0.0%	0.7%	0.0%	26.9%
1979-2011	1308		0.7%	0.0%	0.0%	0.2%	0.3%	8.1%	4.8%	0.6%	11.3%	0.1%	0.8%	0.0%	4.8%	0.0%	0.3%	31.8%	9.6%	0.0%	0.4%	1.8%	24.3%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	1370		0.4%	0.0%	0.0%	0.2%	0.2%	12.5%	3.5%	2.0%	14.1%	0.1%	2.3%	0.0%	6.4%	0.0%	0.2%	24.1%	12.6%	0.0%	0.2%	0.7%	20.4%
1996-1998	1190		1.4%	0.1%	0.0%	0.1%	0.0%	1.7%	1.9%	0.0%	12.2%	0.2%	0.6%	0.0%	1.0%	0.0%	0.0%	35.8%	10.1%	0.0%	0.0%	5.1%	29.9%
1999-2011	1302		0.7%	0.1%	0.0%	0.3%	0.4%	7.2%	6.2%	0.0%	9.6%	0.0%	0.1%	0.0%	4.9%	0.0%	0.4%	35.1%	7.9%	0.0%	0.5%	1.6%	25.1%

Appendix C30. Percent distribution of Lower Shuswap River Summer (Fraser Early) total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	120	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	842	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	1936	2,3,4	8.2%	0.2%	0.1%	10.3%	1.2%	5.4%	0.1%	0.0%	2.3%	1.8%	8.3%	0.0%	0.0%	0.0%	0.1%	1.7%	0.3%	0.0%	0.0%	2.2%	58.0%
1989	1568	2,3,4,5	5.5%	4.7%	0.0%	7.7%	0.0%	1.1%	0.0%	0.0%	0.4%	0.6%	13.5%	0.0%	0.0%	0.0%	0.0%	1.7%	0.1%	0.0%	0.0%	0.4%	64.2%
1990	1209	2,3,4,5	28.7%	0.0%	0.9%	20.1%	1.3%	3.9%	3.1%	0.0%	1.7%	1.8%	11.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.6%	25.3%
1991	654	2,3,4,5	32.9%	0.0%	0.6%	21.6%	1.4%	2.9%	0.0%	0.0%	0.5%	1.4%	11.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	0.0%	0.6%	23.4%
1992	265	2,3,4,5	15.1%	0.0%	0.0%	20.0%	1.5%	4.9%	0.0%	0.0%	7.5%	7.2%	11.7%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	0.0%	0.0%	4.9%	24.2%
1993	593	2,3,4,5	10.5%	1.5%	0.0%	10.3%	0.7%	8.1%	0.0%	0.0%	0.3%	0.8%	12.8%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%	51.8%
1994	1078	2,3,4,5	9.1%	0.0%	1.1%	17.0%	2.7%	7.9%	0.0%	0.9%	0.9%	9.7%	14.1%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	0.0%	0.0%	0.0%	32.6%
1995	462	2,3,4,5	18.4%	0.0%	4.3%	13.0%	8.9%	3.9%	0.0%	0.0%	1.9%	0.9%	9.7%	0.0%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	0.2%	0.4%	34.0%
1996	692	2,3,4,5	17.6%	0.0%	0.0%	0.6%	3.3%	0.3%	1.2%	0.0%	3.6%	0.0%	8.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	1.3%	62.9%
1997	576	2,3,4,5	14.2%	1.0%	0.0%	9.0%	4.5%	0.7%	0.0%	0.0%	5.9%	0.2%	17.9%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%	0.2%	0.0%	43.2%
1998	760	2,3,4,5	21.3%	0.5%	9.1%	7.0%	16.7%	0.0%	0.8%	0.0%	7.0%	0.0%	5.5%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.7%	0.7%	29.9%
1999	782	2,3,4,5	16.6%	0.0%	6.8%	0.8%	7.0%	0.0%	0.0%	0.0%	3.2%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.4%	60.1%
2000	738	2,3,4,5	10.7%	0.0%	9.9%	0.0%	5.0%	0.0%	0.0%	0.0%	5.6%	0.0%	6.6%	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	0.0%	0.4%	1.4%	59.8%
2001	1175	2,3,4,5	8.0%	1.4%	0.3%	0.0%	5.1%	0.0%	0.0%	0.1%	6.6%	0.3%	1.4%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	1.2%	1.5%	73.9%
2002	1543	2,3,4,5	18.4%	0.0%	3.4%	12.8%	6.9%	1.3%	0.0%	0.0%	3.1%	0.1%	8.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.5%	44.6%
2003	2071	2,3,4,5	8.9%	0.8%	1.8%	7.0%	5.0%	0.0%	0.2%	0.0%	4.7%	1.2%	3.2%	0.0%	0.3%	0.0%	0.0%	0.5%	0.0%	0.0%	1.0%	2.1%	63.3%
2004	1181	2,3,4,5	17.4%	0.0%	1.9%	9.1%	10.9%	0.8%	0.0%	0.0%	5.0%	0.0%	11.3%	0.0%	0.3%	0.0%	0.0%	1.3%	0.0%	0.0%	0.4%	2.7%	39.0%
2005	825	2,3,4,5	15.0%	0.0%	0.8%	12.4%	17.1%	0.4%	3.2%	0.0%	4.5%	0.0%	6.9%	0.0%	0.2%	0.0%	0.0%	0.4%	0.0%	0.0%	0.1%	3.8%	35.3%
2006	1314	2,3,4,5	12.1%	0.0%	2.1%	13.2%	13.4%	0.3%	1.0%	0.0%	7.1%	0.0%	6.7%	0.0%	0.2%	0.0%	0.0%	0.8%	0.0%	0.0%	0.5%	3.2%	39.3%
2007	518	2,3,4,5	7.5%	0.2%	7.7%	3.1%	9.8%	0.0%	1.0%	0.0%	8.7%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	52.7%
2008	1780	2,3,4,5	8.8%	0.0%	0.5%	7.9%	9.0%	0.0%	1.6%	0.0%	6.8%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	3.0%	59.5%
2009	1730	2,3,4,5	9.0%	0.0%	1.3%	6.3%	6.1%	0.8%	2.3%	0.0%	8.1%	0.0%	9.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.3%	0.0%	1.0%	6.1%	49.2%
2010	2033	2,3,4,5	9.9%	0.0%	1.5%	10.4%	8.3%	0.0%	0.5%	0.0%	5.3%	0.0%	8.7%	0.0%	0.3%	0.0%	0.1%	1.7%	0.0%	0.0%	0.6%	2.4%	50.2%
2011	1884	2,3,4,5	8.2%	0.1%	1.8%	7.4%	6.1%	1.3%	0.8%	0.0%	7.5%	0.0%	10.8%	0.0%	0.5%	0.0%	0.0%	0.4%	0.7%	0.0%	1.0%	2.9%	50.6%
2012	1968	2,3,4,5	6.6%	0.0%	2.1%	7.3%	7.1%	1.1%	1.8%	0.0%	12.6%	0.0%	4.4%	0.0%	0.2%	0.0%	0.3%	0.2%	0.5%	0.0%	0.7%	4.7%	50.6%
1979-2012	1173		13.6%	0.4%	2.3%	9.4%	6.4%	1.8%	0.7%	0.0%	4.8%	1.0%	8.5%	0.0%	0.1%	0.0%	0.0%	1.0%	0.2%	0.0%	0.4%	2.2%	47.1%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	971		16.0%	0.8%	0.9%	15.0%	2.2%	4.8%	0.4%	0.1%	2.0%	3.0%	11.5%	0.0%	0.0%	0.0%	0.0%	1.9%	0.5%	0.0%	0.0%	1.6%	39.2%
1996-1998	676		17.7%	0.5%	3.0%	5.5%	8.2%	0.3%	0.6%	0.0%	5.5%	0.1%	10.7%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.5%	0.7%	45.3%
1999-2012	1396		11.2%	0.2%	3.0%	7.0%	8.3%	0.4%	0.9%	0.0%	6.3%	0.1%	6.3%	0.0%	0.2%	0.0%	0.1%	0.4%	0.1%	0.0%	0.6%	2.8%	52.0%

Appendix C31. Percent distribution of Skagit Spring Fingerling total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM													
	# of		SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	32	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	70	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	38	4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	4	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	83	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	559	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	984	2,3,4	1.5%	0.0%	0.0%	0.2%	0.8%	2.0%	4.3%	0.0%	10.9%	0.3%	2.8%	0.0%	0.0%	0.0%	0.0%	0.8%	9.0%	0.0%	0.5%	0.0%	66.8%
1998	780	2,3,4,5	1.9%	0.0%	0.0%	0.0%	1.2%	0.0%	5.0%	0.0%	16.2%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.4%	5.8%	0.0%	1.2%	0.0%	67.7%
1999	1809	2,3,4,5	0.9%	0.2%	0.0%	0.3%	0.8%	2.3%	6.4%	0.0%	6.4%	0.0%	0.1%	0.0%	0.4%	0.0%	0.0%	0.5%	2.8%	0.0%	1.0%	0.0%	77.9%
2000	1243	2,3,4,5	1.9%	0.0%	0.6%	0.0%	0.6%	6.4%	7.2%	0.0%	13.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	5.0%	0.0%	0.1%	0.0%	64.9%
2001	2005	2,3,4,5	1.7%	0.1%	0.3%	0.3%	0.9%	5.6%	4.0%	0.0%	6.7%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	9.6%	0.0%	0.4%	0.0%	69.8%
2002	1811	2,3,4,5	2.8%	0.0%	0.6%	0.6%	0.9%	5.5%	5.1%	0.0%	8.1%	0.0%	0.1%	0.0%	0.3%	0.0%	0.1%	0.0%	3.8%	0.0%	0.6%	0.0%	71.6%
2003	705	2,3,4,5	2.4%	0.0%	1.0%	1.3%	0.9%	18.4%	0.9%	0.0%	6.8%	0.0%	0.3%	0.0%	1.4%	0.0%	0.0%	0.1%	1.8%	0.0%	0.7%	0.0%	64.0%
2004	1180	2,3,4,5	0.0%	0.0%	0.0%	0.5%	0.0%	11.9%	3.0%	0.0%	9.7%	0.0%	0.0%	0.0%	2.7%	0.0%	0.0%	0.0%	2.6%	0.0%	1.4%	0.0%	68.1%
2005	1319	2,3,4,5	1.6%	0.2%	0.0%	0.0%	1.8%	11.1%	6.0%	0.0%	7.7%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.3%	4.1%	66.1%
2006	1883	2,3,4,5	0.4%	0.1%	0.0%	0.3%	0.5%	6.3%	3.0%	0.0%	8.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.5%	3.5%	0.0%	1.0%	20.8%	55.5%
2007	2678	2,3,4,5	0.4%	0.2%	0.0%	0.0%	0.0%	8.8%	6.6%	0.0%	7.8%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.3%	3.7%	0.0%	1.3%	21.2%	48.9%
2008	1568	2,3,4,5	0.4%	0.0%	0.0%	0.0%	0.3%	3.6%	6.4%	0.0%	5.5%	0.0%	0.3%	0.0%	0.7%	0.0%	0.0%	1.1%	8.1%	0.0%	12.1%	15.9%	45.5%
2009	993	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.0%	2.7%	5.6%	0.0%	5.4%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	9.5%	0.0%	16.6%	11.2%	46.9%
2010	1729	2,3,4,5	0.1%	0.0%	0.0%	0.0%	1.9%	2.0%	3.6%	0.0%	3.8%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%	2.3%	0.0%	17.2%	13.5%	55.2%
2011	1606	2,3,4,5	0.4%	0.1%	0.0%	0.0%	0.3%	1.1%	4.2%	0.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	7.9%	0.0%	15.9%	7.7%	58.0%
1979-2011	1486		1.2%	0.1%	0.2%	0.2%	0.7%	5.9%	4.8%	0.0%	8.0%	0.0%	0.3%	0.0%	0.5%	0.0%	0.0%	0.3%	5.1%	0.0%	4.7%	6.3%	61.8%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1996-1998	882		1.7%	0.0%	0.0%	0.1%	1.0%	1.0%	4.6%	0.0%	13.5%	0.2%	1.8%	0.0%	0.0%	0.0%	0.0%	0.6%	7.4%	0.0%	0.8%	0.0%	67.2%
1999-2011	1579		1.1%	0.1%	0.2%	0.2%	0.7%	6.6%	4.8%	0.0%	7.1%	0.0%	0.1%	0.0%	0.6%	0.0%	0.0%	0.2%	4.7%	0.0%	5.3%	7.3%	61.0%

Appendix C32. Percent distribution of Skagit Spring Yearling total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM															
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			Esc.
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	7	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	77	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	131	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	6.9%	0.0%	0.0%	29.8%	0.0%	25.2%	0.0%	0.0%	0.0%	0.0%	9.2%	18.3%	0.0%	0.0%	0.0%	10.7%
1986	229	2,3,4,5	1.7%	0.0%	0.0%	0.0%	0.0%	6.1%	5.7%	6.1%	36.2%	3.9%	9.2%	0.0%	0.0%	0.0%	0.0%	3.1%	9.2%	0.0%	0.0%	0.0%	18.8%
1987	164	2,3,4,5	0.0%	0.0%	0.0%	4.9%	0.0%	3.0%	0.0%	0.0%	8.5%	0.0%	9.1%	0.0%	1.2%	0.0%	0.0%	17.1%	40.9%	0.0%	0.0%	0.0%	15.2%
1988	591	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	9.1%	0.5%	18.4%	0.0%	12.4%	0.0%	2.0%	0.0%	0.0%	19.1%	16.1%	0.0%	0.0%	0.0%	20.0%
1989	867	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	1.8%	0.0%	21.1%	0.8%	3.3%	0.0%	4.6%	0.0%	0.0%	11.2%	10.3%	0.0%	16.7%	0.0%	26.2%
1990	733	3,4,5	0.0%	0.0%	0.0%	0.0%	1.1%	5.0%	8.6%	3.3%	12.0%	0.4%	5.5%	0.0%	3.7%	0.0%	0.0%	12.8%	24.3%	0.0%	1.8%	0.0%	21.6%
1991	502	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	103	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	422	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	754	4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	184	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	192	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	643	2,3,4	0.3%	0.0%	0.0%	0.0%	0.5%	3.1%	8.7%	0.0%	22.2%	0.0%	3.9%	0.0%	0.0%	0.0%	0.0%	0.9%	30.0%	0.0%	0.8%	0.0%	29.5%
1998	1242	2,3,4,5	0.6%	0.2%	0.0%	0.0%	3.2%	1.1%	9.8%	0.0%	10.2%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	2.3%	20.8%	0.0%	0.6%	0.0%	50.8%
1999	2537	2,3,4,5	0.7%	0.0%	0.0%	0.0%	0.4%	5.6%	4.4%	0.0%	7.8%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%	12.0%	0.0%	1.1%	0.0%	67.8%
2000	575	2,3,4,5	0.7%	0.0%	0.0%	0.0%	0.5%	6.6%	3.1%	0.0%	16.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	19.8%	0.0%	0.5%	0.0%	51.3%
2001	349	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	2.0%	0.0%	19.8%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	24.1%	0.0%	1.4%	0.0%	47.6%
2002	320	2,3,4,5	0.9%	0.0%	0.0%	0.0%	0.0%	0.6%	14.4%	0.0%	19.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	13.1%	0.0%	0.6%	0.0%	50.0%
2003	964	2,3,4,5	0.0%	0.0%	0.0%	0.9%	0.4%	19.3%	4.6%	0.0%	11.3%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.5%	10.3%	0.0%	0.2%	0.0%	52.4%
2004	1654	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.5%	12.9%	4.1%	0.0%	6.4%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.2%	5.7%	0.0%	0.8%	0.1%	68.3%
2005	1251	2,3,4,5	1.1%	0.0%	0.0%	0.2%	0.0%	7.4%	5.6%	0.0%	12.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.2%	0.1%	8.6%	0.0%	0.9%	7.0%	56.3%
2006	822	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	8.4%	6.2%	0.0%	13.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.5%	4.7%	0.0%	1.0%	33.8%	31.3%
2007	851	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	8.1%	0.0%	5.2%	0.0%	0.0%	0.0%	0.5%	0.0%	0.2%	0.9%	17.6%	0.0%	0.4%	25.4%	39.4%
2008	773	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	3.8%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	12.7%	0.0%	11.5%	21.7%	41.9%
2009	394	2,3,4,5	1.0%	0.0%	0.0%	0.0%	3.8%	1.5%	13.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.3%	10.7%	0.0%	14.5%	13.7%	39.6%
2010	495	2,3,4,5	0.2%	0.0%	0.0%	0.0%	1.0%	0.0%	2.6%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	0.0%	15.4%	30.9%	39.4%
2011	607	3,4,5	0.0%	0.0%	0.0%	0.0%	0.7%	2.1%	4.3%	0.0%	8.2%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.5%	12.5%	0.0%	10.7%	21.4%	39.4%
1979-2011	771		0.4%	0.0%	0.0%	0.3%	0.6%	4.9%	5.7%	0.5%	13.6%	0.2%	3.3%	0.0%	0.9%	0.0%	0.1%	3.8%	15.8%	0.0%	3.8%	7.3%	38.9%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	452		0.3%	0.0%	0.0%	0.8%	0.2%	4.6%	4.2%	1.6%	21.0%	0.9%	10.8%	0.0%	1.9%	0.0%	0.0%	12.1%	19.8%	0.0%	3.1%	0.0%	18.7%
1996-1998	942		0.5%	0.1%	0.0%	0.0%	1.8%	2.1%	9.3%	0.0%	16.2%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	1.6%	25.4%	0.0%	0.7%	0.0%	40.2%
1999-2011	892		0.4%	0.0%	0.0%	0.1%	0.6%	5.5%	5.9%	0.0%	9.8%	0.0%	0.0%	0.0%	0.5%	0.0%	0.1%	0.4%	12.4%	0.0%	4.5%	11.9%	48.0%

Appendix C33. Percent distribution of Skykomish Fall Fingerling (Snohomish Wild) total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM													
	# of		SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	21	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	133	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	611	2,3,4	0.5%	0.0%	0.0%	0.0%	2.0%	16.2%	3.6%	0.0%	8.5%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.5%	8.2%	0.0%	0.0%	0.0%	60.1%
2005	553	2,3,4,5	0.9%	0.0%	0.0%	0.4%	0.0%	18.3%	8.9%	0.0%	6.7%	0.0%	0.7%	0.0%	3.3%	0.0%	0.5%	0.0%	3.8%	0.0%	0.0%	0.0%	56.6%
2006	657	2,3,4,5	1.2%	0.0%	0.0%	0.3%	0.0%	14.0%	4.1%	0.0%	9.7%	0.0%	0.2%	0.0%	5.0%	0.0%	0.0%	0.9%	8.4%	0.0%	0.0%	0.0%	56.2%
2007	1157	2,3,4,5	0.5%	0.0%	0.0%	0.2%	1.3%	15.0%	6.6%	0.0%	4.8%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	1.6%	7.5%	0.0%	0.0%	0.0%	59.4%
2008	749	2,3,4,5	0.3%	0.0%	0.0%	0.0%	0.0%	9.1%	2.9%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	8.5%	0.0%	0.0%	0.0%	74.8%
2009	358	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	4.7%	0.0%	4.7%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	17.0%	0.0%	0.0%	0.0%	69.8%
2010	411	2,3,4,5	0.0%	0.2%	0.0%	0.0%	0.0%	2.7%	2.4%	0.0%	3.2%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	1.7%	8.5%	0.0%	0.0%	2.9%	77.6%
2011	518	2,3,4,5	0.4%	0.6%	0.0%	0.0%	0.0%	1.9%	3.5%	0.0%	7.7%	0.0%	0.0%	0.0%	1.5%	0.0%	0.6%	0.8%	19.7%	0.0%	0.0%	9.7%	53.7%
1979-2011	627		0.5%	0.1%	0.0%	0.1%	0.4%	9.9%	4.6%	0.0%	6.1%	0.0%	0.1%	0.0%	2.0%	0.0%	0.1%	0.8%	10.2%	0.0%	0.0%	1.6%	63.5%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1996-1998	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1999-2011	627		0.5%	0.1%	0.0%	0.1%	0.4%	9.9%	4.6%	0.0%	6.1%	0.0%	0.1%	0.0%	2.0%	0.0%	0.1%	0.8%	10.2%	0.0%	0.0%	1.6%	63.5%

Appendix C34. Percent distribution of Sooes Fall Fingerling (Washington Coastal Wild) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	17	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	33	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	230	2,3,4	8.3%	20.4%	0.4%	2.6%	0.0%	3.9%	6.1%	0.0%	0.4%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	51.7%
1990	170	3,4,5	11.8%	5.9%	4.1%	16.5%	0.0%	17.6%	0.0%	0.0%	6.5%	1.8%	2.4%	0.0%	1.8%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	28.8%
1991	375	2,4,5,6	13.6%	0.0%	0.3%	10.7%	0.0%	7.2%	0.0%	0.0%	0.3%	0.3%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	0.0%	0.0%	0.0%	59.2%
1992	327	2,3,5,6	10.7%	0.3%	0.3%	10.7%	0.0%	20.5%	1.5%	0.0%	1.2%	2.1%	3.1%	0.0%	0.3%	0.0%	0.6%	0.0%	1.8%	0.0%	0.0%	0.0%	46.8%
1993	253	2,3,4,6	7.1%	0.4%	0.0%	7.9%	2.0%	17.0%	0.0%	0.0%	0.0%	2.0%	2.0%	0.0%	0.4%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	60.1%
1994	244	2,3,4,5	18.0%	14.8%	3.3%	9.0%	0.8%	7.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	45.5%
1995	180	2,3,4,5,6	13.9%	0.0%	0.0%	6.1%	0.0%	12.8%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	62.8%
1996	226	2,3,4,5,6	15.5%	0.0%	0.0%	0.9%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	82.3%
1997	310	2,3,4,5,6	11.9%	0.0%	5.8%	4.8%	0.0%	0.0%	2.6%	0.0%	1.6%	0.6%	0.6%	0.0%	1.0%	0.0%	0.0%	3.9%	0.0%	0.0%	21.0%	0.0%	46.1%
1998	284	2,3,4,5,6	10.2%	0.0%	1.8%	20.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	68.0%
1999	236	2,3,4,5,6	13.1%	0.0%	13.1%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	65.7%
2000	89	2,3,4,5,6	0.0%	0.0%	5.6%	0.0%	0.0%	0.0%	12.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	82.0%
2001	314	2,3,4,5,6	9.2%	0.0%	2.9%	0.0%	0.0%	0.0%	2.5%	0.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.1%
2002	566	2,3,4,5,6	13.1%	0.2%	1.6%	3.4%	3.7%	0.7%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	75.4%
2003	804	2,3,4,5,6	14.1%	0.1%	0.0%	5.5%	2.7%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.9%	0.0%	25.1%	0.0%	49.6%
2004	937	2,3,4,5,6	19.3%	0.7%	2.1%	16.2%	0.0%	0.7%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.0%	0.9%	0.0%	57.3%
2005	525	2,3,4,5,6	27.4%	0.0%	2.3%	25.3%	8.0%	1.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.8%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	31.6%
2006	234	2,3,4,5,6	22.6%	4.3%	2.6%	26.1%	2.1%	1.7%	3.0%	0.0%	5.1%	0.0%	0.0%	0.0%	0.4%	0.0%	1.3%	0.0%	2.1%	0.0%	0.0%	0.0%	28.6%
2007	87	2,3,4,5,6	11.5%	0.0%	0.0%	17.2%	14.9%	0.0%	0.0%	0.0%	13.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	42.5%
2008	116	2,3,4,5,6	8.6%	0.0%	0.0%	14.7%	12.1%	0.0%	9.5%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	52.6%
2009	562	2,3,4,5,6	11.4%	1.2%	1.2%	8.0%	3.9%	0.0%	4.6%	0.0%	2.7%	0.0%	0.0%	0.0%	2.3%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	64.1%
2010	442	2,3,4,5,6	4.3%	0.0%	2.3%	5.4%	1.4%	0.9%	1.1%	0.0%	4.5%	0.0%	0.0%	0.0%	0.2%	0.0%	3.2%	0.2%	1.8%	0.0%	0.0%	0.0%	74.7%
2011	1122	2,3,4,5,6	9.8%	0.5%	1.0%	4.4%	3.6%	1.7%	2.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.4%	0.0%	1.7%	0.0%	0.6%	0.0%	0.0%	0.0%	73.1%
1979-2011	375		12.4%	2.1%	2.2%	9.7%	2.4%	4.0%	2.0%	0.0%	1.9%	0.3%	0.8%	0.0%	0.4%	0.0%	0.6%	0.3%	0.7%	0.0%	2.2%	0.0%	57.9%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	254		11.9%	6.0%	1.2%	9.1%	0.4%	12.3%	1.1%	0.0%	1.2%	1.0%	2.5%	0.0%	0.4%	0.0%	0.5%	0.1%	1.3%	0.0%	0.4%	0.0%	50.7%
1996-1998	273		12.5%	0.0%	2.5%	8.6%	0.0%	0.1%	0.9%	0.0%	0.5%	0.2%	0.4%	0.0%	0.3%	0.0%	0.1%	1.3%	0.0%	0.0%	7.0%	0.0%	65.5%
1999-2011	464		12.7%	0.5%	2.7%	10.2%	4.0%	0.5%	2.8%	0.0%	2.6%	0.0%	0.0%	0.0%	0.5%	0.0%	0.8%	0.1%	0.5%	0.0%	2.0%	0.0%	60.0%

Appendix C35. Percent distribution of Spring Creek Tule (Spring Creek Hatchery) total fishing mortalities among fisheries and escapement.

Catch	Estimated		AABM							ISBM														
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	5253	2,3,4,5	0.0%	0.0%	0.0%	0.1%	[illegible]	24.7%	0.1%	0.2%	1.1%	0.7%	2.5%	0.0%	17.9%	0.7%	7.3%	1.9%	6.0%	0.0%	21.2%	0.0%	15.8%
1980	6885	2,3,4,5	0.1%	0.0%	0.0%	0.1%	0.0%	26.7%	0.1%	0.1%	2.5%	0.6%	1.0%	0.0%	24.9%	2.2%	5.1%	0.8%	5.8%	0.0%	19.6%	0.0%	10.4%
1981	7388	2,3,4,5	0.0%	0.0%	0.0%	0.1%	0.0%	21.5%	0.1%	0.1%	1.3%	0.2%	1.9%	0.0%	24.4%	0.3%	10.9%	0.5%	2.2%	0.0%	20.7%	0.0%	15.8%
1982	4812	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	22.6%	0.0%	0.0%	1.0%	0.5%	0.2%	0.0%	22.1%	0.1%	7.1%	1.1%	1.1%	0.0%	32.7%	0.0%	11.4%
1983	898	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	30.8%	0.4%	0.0%	1.2%	0.4%	0.0%	0.0%	8.9%	[illegible]	4.1%	0.3%	8.0%	0.0%	19.7%	0.0%	25.9%
1984	1184	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	26.3%	0.3%	0.0%	0.0%	[illegible]	1.2%	0.0%	5.8%	0.0%	1.0%	0.9%	9.2%	0.0%	25.8%	2.6%	24.6%
1985	1262	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	14.6%	0.6%	0.0%	0.0%	0.2%	0.2%	0.0%	16.2%	0.0%	2.5%	0.7%	1.4%	0.0%	26.7%	0.2%	36.8%
1986	355	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	24.2%	2.5%	0.0%	2.0%	2.8%	1.7%	0.0%	2.5%	0.0%	2.5%	1.1%	4.8%	0.0%	33.5%	1.1%	21.1%
1987	154	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	9.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.9%	0.0%	7.8%	22.7%	5.2%	0.0%	18.8%	6.5%	14.3%
1988	908	2,3,4,5	0.0%	0.0%	0.0%	0.4%	0.0%	23.9%	2.0%	0.0%	2.0%	0.2%	1.7%	0.0%	15.6%	0.0%	2.8%	1.9%	4.7%	0.0%	29.0%	4.0%	11.9%
1989	2430	2,3,4,5	0.0%	0.0%	0.0%	0.2%	0.0%	16.1%	3.1%	0.0%	0.6%	0.0%	0.4%	0.0%	26.2%	0.0%	3.1%	0.2%	1.9%	0.0%	32.8%	3.2%	12.3%
1990	2537	2,3,4,5	0.0%	0.0%	0.0%	0.2%	0.0%	19.2%	4.4%	0.3%	0.6%	0.4%	0.9%	0.0%	15.0%	0.0%	6.8%	0.4%	5.5%	0.0%	23.3%	2.1%	20.9%
1991	3022	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	14.9%	1.4%	0.0%	0.3%	0.3%	0.5%	0.0%	18.3%	0.0%	4.6%	0.6%	3.2%	0.0%	32.3%	3.7%	19.8%
1992	3205	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	14.1%	2.4%	0.2%	0.5%	0.3%	0.5%	0.0%	28.8%	0.0%	5.1%	0.0%	3.4%	0.0%	14.1%	3.4%	27.2%
1993	1263	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	19.6%	4.1%	0.0%	0.0%	0.0%	0.3%	0.0%	19.2%	0.0%	2.9%	0.0%	5.5%	0.0%	20.5%	3.0%	24.9%
1994	992	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	21.2%	3.8%	0.0%	0.0%	0.0%	0.9%	0.0%	3.3%	0.0%	0.0%	0.0%	1.0%	0.0%	31.7%	0.0%	38.1%
1995	972	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	10.1%	2.8%	0.0%	0.0%	0.0%	0.4%	0.0%	1.9%	0.0%	0.0%	0.5%	0.0%	0.0%	39.5%	0.0%	44.9%
1996	932	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.7%	0.0%	1.2%	0.0%	0.9%	0.0%	57.3%	1.5%	29.1%
1997	640	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	13.6%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	0.0%	1.3%	0.0%	3.9%	0.0%	24.2%	6.9%	42.3%
1998	871	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	1.8%	0.0%	1.3%	0.0%	21.6%	14.2%	56.5%
1999	1654	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	3.9%	0.0%	0.4%	0.0%	0.0%	0.0%	19.4%	0.0%	2.7%	0.0%	0.3%	0.0%	36.3%	6.5%	30.2%
2000	1016	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	1.9%	0.0%	1.8%	0.0%	26.0%	7.6%	48.0%
2001	6776	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.9%	0.0%	0.4%	0.0%	0.0%	0.0%	16.3%	0.0%	3.1%	0.0%	1.2%	0.0%	24.0%	2.2%	48.3%
2002	4706	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%	1.4%	0.0%	0.3%	0.0%	0.0%	0.0%	18.8%	0.0%	8.2%	0.0%	0.6%	0.0%	25.3%	2.5%	32.5%
2003	6414	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	10.2%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	12.2%	0.0%	3.8%	0.0%	0.2%	0.0%	23.3%	2.3%	45.0%
2004	6401	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	12.1%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%	0.0%	3.3%	0.0%	0.4%	0.0%	19.0%	1.9%	49.8%
2005	2466	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	24.4%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	7.2%	0.0%	1.1%	0.0%	0.0%	0.0%	27.8%	0.9%	35.5%
2006	752	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	16.6%	4.9%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	1.9%	0.0%	1.2%	0.0%	38.0%	1.1%	30.5%
2007	1318	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	3.0%	0.0%	1.2%	0.0%	0.0%	0.0%	2.7%	0.0%	3.6%	0.0%	4.7%	0.0%	46.0%	1.5%	31.9%
2008	2318	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	6.7%	0.0%	0.4%	0.0%	0.0%	0.0%	7.5%	0.0%	2.9%	0.0%	1.8%	0.0%	41.8%	2.7%	31.1%
2009	2861	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.3%	1.2%	2.3%	0.0%	0.6%	0.0%	0.0%	0.0%	1.5%	0.0%	3.4%	0.0%	6.2%	0.0%	40.5%	2.4%	41.5%
2010	4358	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.2%	4.6%	3.1%	0.0%	0.6%	0.0%	0.0%	0.0%	15.5%	0.1%	5.2%	0.0%	0.9%	0.0%	37.0%	1.4%	31.3%
2011	2444	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	6.0%	0.0%	0.3%	0.0%	0.0%	0.0%	7.6%	0.9%	6.2%	0.0%	0.6%	0.0%	45.1%	1.3%	26.6%
1979-2011	2711		0.0%	0.0%	0.0%	0.0%	0.0%	13.9%	2.5%	0.0%	0.5%	0.3%	0.4%	0.0%	12.4%	0.1%	3.8%	1.0%	2.9%	0.0%	29.5%	2.6%	29.9%
1979-1984	4403		0.0%	0.0%	0.0%	0.0%	0.0%	25.4%	0.2%	0.1%	1.2%	0.8%	1.1%	0.0%	17.3%	0.5%	5.9%	0.9%	5.4%	0.0%	23.3%	0.4%	17.3%
1985-1995	1555		0.0%	0.0%	0.0%	0.1%	0.0%	17.1%	2.5%	0.0%	0.5%	0.4%	0.7%	0.0%	14.7%	0.0%	3.5%	2.6%	3.3%	0.0%	27.5%	2.5%	24.7%
1996-1998	814		0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	1.4%	0.0%	2.0%	0.0%	34.4%	7.5%	42.6%
1999-2011	3345		0.0%	0.0%	0.0%	0.0%	0.0%	8.0%	3.6%	0.0%	0.3%	0.0%	0.0%	0.0%	10.0%	0.1%	3.6%	0.0%	1.5%	0.0%	33.1%	2.6%	37.1%

Appendix C36. Percent distribution of South Puget Sound Fall Fingerling (Puget Sound Hatchery Fingerling) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM															Esc.
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	
1979	1027	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	621	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	1276	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	3230	2,3,4	0.2%	0.1%	0.0%	0.2%	0.1%	22.5%	0.1%	2.1%	10.6%	0.9%	1.8%	0.0%	2.8%	0.0%	0.1%	17.3%	24.6%	0.0%	7.1%	0.0%	9.4%
1983	5023	2,3,4,5	0.1%	0.0%	0.0%	0.7%	0.1%	17.3%	0.2%	0.2%	3.7%	1.7%	2.7%	0.0%	1.6%	0.0%	0.0%	19.3%	34.7%	0.0%	6.5%	0.2%	10.9%
1984	3996	2,3,4,5	0.1%	0.2%	0.0%	0.7%	0.1%	21.0%	0.3%	1.3%	7.1%	1.4%	1.1%	0.0%	1.5%	0.0%	0.1%	14.6%	24.5%	0.0%	9.0%	0.2%	16.7%
1985	1572	2,3,4,5	0.8%	0.0%	0.0%	0.0%	0.2%	18.3%	0.9%	0.3%	6.0%	0.3%	1.9%	0.0%	1.9%	0.0%	0.0%	17.3%	20.8%	0.0%	11.2%	0.0%	20.2%
1986	555	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	18.9%	0.0%	0.0%	7.4%	0.0%	2.9%	0.0%	4.0%	0.0%	1.3%	9.0%	26.7%	0.0%	0.7%	0.0%	29.2%
1987	594	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	20.9%	0.0%	0.0%	12.0%	0.0%	1.4%	0.0%	8.8%	0.8%	0.2%	10.6%	15.2%	0.0%	0.0%	0.0%	28.3%
1988	2811	2,3,4,5	0.3%	0.0%	0.0%	0.2%	0.4%	9.2%	3.0%	0.1%	17.1%	0.9%	3.2%	0.0%	7.0%	0.0%	0.5%	19.2%	20.4%	0.0%	1.0%	0.0%	17.4%
1989	5623	2,3,4,5	0.1%	0.0%	0.0%	0.3%	0.0%	8.8%	2.4%	0.2%	5.2%	0.4%	3.7%	0.0%	12.2%	0.0%	0.4%	14.6%	17.1%	0.0%	5.8%	0.0%	28.8%
1990	5950	2,3,4,5	0.0%	0.1%	0.1%	0.3%	0.0%	23.8%	4.3%	0.3%	3.7%	0.3%	1.2%	0.0%	9.2%	0.0%	0.4%	13.3%	13.0%	0.0%	9.2%	0.5%	20.5%
1991	1912	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	16.4%	2.7%	0.2%	1.8%	0.1%	0.9%	0.0%	12.2%	0.0%	0.4%	11.3%	14.0%	0.0%	14.0%	0.3%	25.3%
1992	1632	2,3,4,5	0.6%	0.4%	0.0%	0.0%	0.0%	17.2%	2.0%	0.3%	4.4%	0.9%	2.8%	0.0%	8.9%	0.0%	0.6%	12.6%	23.2%	0.0%	8.6%	0.0%	17.6%
1993	1623	2,3,4,5	0.3%	0.1%	0.0%	0.0%	0.0%	17.9%	4.4%	1.0%	3.8%	0.1%	2.6%	0.0%	5.9%	0.0%	0.2%	7.8%	22.7%	0.0%	7.0%	0.0%	26.3%
1994	1906	2,3,4,5	0.0%	0.0%	0.0%	0.5%	0.0%	9.4%	1.3%	0.0%	4.9%	0.0%	4.9%	0.0%	0.6%	0.0%	0.0%	10.9%	16.4%	0.0%	4.9%	0.3%	46.0%
1995	4022	2,3,4,5	0.2%	0.1%	0.0%	0.1%	0.0%	5.3%	1.1%	0.0%	2.8%	0.0%	1.7%	0.0%	1.3%	0.0%	0.0%	4.7%	17.5%	0.0%	1.0%	0.0%	64.2%
1996	5215	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.1%	0.9%	1.7%	0.0%	5.0%	0.0%	0.5%	0.0%	2.8%	0.0%	0.0%	3.7%	18.1%	0.0%	2.6%	0.0%	64.3%
1997	2741	2,3,4,5	0.5%	0.0%	0.0%	0.5%	0.0%	6.6%	1.5%	0.0%	2.0%	0.0%	0.9%	0.0%	1.6%	0.0%	0.1%	2.1%	16.1%	0.0%	0.7%	0.2%	67.1%
1998	1914	2,3,4,5	1.4%	0.0%	0.0%	0.6%	0.1%	0.5%	1.5%	0.0%	2.4%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	4.2%	11.5%	0.0%	3.9%	0.5%	72.4%
1999	2293	2,3,4,5	0.6%	0.0%	0.0%	0.3%	0.0%	0.7%	4.2%	0.0%	3.4%	0.0%	0.0%	0.0%	3.5%	0.0%	0.3%	4.5%	7.5%	0.0%	4.8%	0.0%	70.2%
2000	2558	2,3,4,5	0.4%	0.1%	0.0%	0.0%	0.0%	9.7%	4.5%	0.0%	2.9%	0.0%	0.0%	0.0%	0.3%	0.0%	0.2%	6.3%	13.7%	0.0%	5.9%	0.0%	56.0%
2001	4180	2,3,4,5	0.1%	0.0%	0.0%	0.0%	0.1%	8.2%	3.3%	0.0%	3.9%	0.0%	0.0%	0.0%	4.6%	0.0%	0.4%	4.0%	13.9%	0.0%	6.9%	0.0%	54.4%
2002	3656	2,3,4,5	0.9%	0.0%	0.0%	0.8%	0.1%	11.1%	3.4%	0.0%	5.3%	0.0%	0.3%	0.0%	4.3%	0.0%	0.5%	3.5%	9.3%	0.0%	14.1%	0.0%	46.5%
2003	2351	2,3,4,5	0.7%	0.0%	0.0%	0.9%	0.0%	13.4%	4.3%	0.0%	4.5%	0.0%	0.0%	0.0%	5.3%	0.0%	0.4%	6.6%	12.9%	0.0%	7.1%	0.0%	43.9%
2004	2236	2,3,4,5	0.4%	0.1%	0.0%	0.6%	0.4%	17.0%	4.4%	0.0%	3.6%	0.0%	0.0%	0.0%	10.0%	0.0%	1.4%	7.5%	14.5%	0.0%	6.2%	0.0%	33.9%
2005	2362	2,3,4,5	0.0%	0.0%	0.0%	0.4%	0.6%	13.1%	4.8%	0.0%	5.2%	0.0%	0.0%	0.0%	6.1%	0.0%	1.2%	4.0%	10.3%	0.0%	1.8%	0.0%	52.3%
2006	3607	2,3,4,5	0.3%	0.0%	0.1%	0.5%	0.4%	12.0%	2.8%	0.0%	2.8%	0.0%	0.0%	0.0%	7.0%	0.0%	0.5%	6.4%	9.8%	0.0%	7.9%	0.0%	49.4%
2007	3723	2,3,4,5	0.2%	0.0%	0.0%	0.2%	0.0%	11.5%	4.6%	0.0%	1.9%	0.0%	0.0%	0.0%	5.7%	0.0%	0.2%	3.1%	16.1%	0.0%	12.1%	0.2%	44.3%
2008	2639	2,3,4,5	0.0%	0.0%	0.0%	0.3%	0.0%	7.2%	3.8%	0.0%	3.0%	0.0%	0.0%	0.0%	3.2%	0.0%	0.4%	4.1%	14.6%	0.0%	13.0%	0.3%	50.3%
2009	3048	2,3,4,5	0.1%	0.0%	0.0%	0.2%	0.0%	5.0%	8.8%	0.0%	5.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.3%	2.5%	13.8%	0.0%	12.4%	0.2%	48.8%
2010	2951	2,3,4,5	0.1%	0.0%	0.0%	0.1%	0.7%	5.5%	5.7%	0.0%	2.7%	0.0%	0.0%	0.0%	2.9%	0.0%	1.4%	1.2%	11.3%	0.0%	1.1%	0.0%	67.4%
2011	2895	2,3,4,5	0.3%	0.1%	0.0%	0.0%	0.1%	3.5%	5.6%	0.0%	4.0%	0.0%	0.0%	0.0%	3.2%	0.0%	0.4%	1.6%	15.9%	0.0%	6.6%	0.0%	58.8%
1979-2011	2959		0.3%	0.0%	0.0%	0.3%	0.1%	11.8%	2.9%	0.2%	4.9%	0.2%	1.2%	0.0%	4.7%	0.0%	0.4%	8.3%	16.7%	0.0%	6.4%	0.1%	41.4%
1979-1984	4083		0.2%	0.1%	0.0%	0.5%	0.1%	20.3%	0.2%	1.2%	7.1%	1.4%	1.9%	0.0%	1.9%	0.0%	0.1%	17.1%	28.0%	0.0%	7.6%	0.1%	12.3%
1985-1995	2559		0.3%	0.1%	0.0%	0.1%	0.1%	15.1%	2.0%	0.2%	6.3%	0.3%	2.7%	0.0%	6.5%	0.1%	0.4%	11.9%	18.8%	0.0%	5.8%	0.1%	29.4%
1996-1998	3290		0.7%	0.0%	0.0%	0.4%	0.0%	2.7%	1.6%	0.0%	3.2%	0.0%	0.5%	0.0%	1.8%	0.0%	0.0%	3.3%	15.3%	0.0%	2.4%	0.2%	68.0%
1999-2011	2961		0.3%	0.0%	0.0%	0.3%	0.2%	9.1%	4.6%	0.0%	3.7%	0.0%	0.0%	0.0%	4.5%	0.0%	0.6%	4.3%	12.6%	0.0%	7.7%	0.1%	52.0%

Appendix C37. Percent distribution of South Puget Sound Fall Yearling (Puget Sound Hatchery Yearling) total fishing mortalities among fisheries and escapement.

	Estimated		AABM							ISBM													
Catch	# of	Ages	SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	18	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	163	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	334	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	2.4%	2.4%	0.0%	0.0%	0.9%	0.0%	0.0%	12.0%	68.0%	0.0%	2.1%	1.5%	7.2%
1983	494	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	0.0%	0.0%	0.4%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%	78.9%	0.0%	0.0%	0.0%	4.7%
1984	265	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	7.2%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	31.7%	45.3%	0.0%	0.8%	0.0%	13.2%
1985	70	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	146	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	743	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	1432	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.1%	0.1%	0.5%	0.0%	1.6%	0.0%	0.1%	31.1%	55.0%	0.0%	0.3%	0.6%	9.8%
1991	1234	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	3.5%	0.0%	0.0%	11.3%	62.2%	0.0%	0.2%	0.4%	16.5%
1992	592	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%	1.2%	0.0%	0.8%	0.0%	0.0%	0.0%	4.7%	0.0%	0.7%	25.7%	50.8%	0.0%	1.0%	0.0%	10.1%
1993	508	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	6.9%	71.7%	0.0%	0.0%	2.0%	15.4%
1994	886	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.7%	0.0%	0.9%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	15.1%	65.2%	0.0%	0.0%	0.0%	14.7%
1995	805	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	1.6%	0.0%	2.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	7.8%	73.5%	0.0%	0.2%	1.4%	6.8%
1996	815	2,3,4,5	0.5%	0.0%	0.0%	0.0%	0.0%	0.1%	1.1%	0.0%	1.8%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	2.6%	89.6%	0.0%	0.2%	0.6%	2.8%
1997	583	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.3%	0.0%	1.0%	0.0%	0.0%	0.0%	1.0%	0.0%	2.1%	3.4%	70.0%	0.0%	0.0%	0.0%	20.6%
1998	113	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	1.8%	85.8%	0.0%	2.7%	0.0%	8.0%
1999	103	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.6%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	1.0%	80.6%	0.0%	0.0%	0.0%	1.9%
2000	96	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	9.4%	74.0%	0.0%	0.0%	0.0%	5.2%
2001	80	2,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	78.8%	0.0%	0.0%	0.0%	15.0%
2002	10	2,3,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	7	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	264	2,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	11.4%	38.6%	0.0%	1.9%	0.0%	46.6%
2005	319	2,3,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	1.3%	14.1%	60.5%	0.0%	2.8%	0.0%	19.1%
2006	422	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	16.6%	51.9%	0.0%	1.9%	0.0%	19.4%
2007	345	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	1.4%	16.8%	52.5%	0.0%	2.6%	0.0%	21.2%
2008	136	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	6.6%	47.8%	0.0%	14.0%	0.0%	26.5%
2009	226	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	4.0%	55.8%	0.0%	1.8%	8.0%	14.6%
2010	168	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	4.2%	0.0%	0.0%	0.0%	0.6%	0.0%	1.8%	7.7%	28.0%	0.0%	0.0%	0.0%	56.0%
2011[1]	223	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	2.2%	0.4%	21.1%	63.7%	0.0%	6.3%	0.0%	1.3%
1979-2011	454		0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	1.4%	0.0%	1.4%	0.2%	0.1%	0.0%	1.7%	0.1%	0.3%	11.6%	63.0%	0.0%	1.7%	0.6%	15.5%
1979-1984	364		0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%	1.6%	1.4%	0.0%	0.0%	0.3%	0.0%	0.0%	17.5%	64.1%	0.0%	1.0%	0.5%	8.3%
1985-1995	910		0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	0.6%	0.0%	1.1%	0.0%	0.5%	0.0%	1.9%	0.0%	0.1%	16.3%	63.1%	0.0%	0.3%	0.7%	12.2%
1996-1998	504		0.2%	0.0%	0.0%	0.0%	0.0%	0.6%	0.5%	0.0%	1.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.7%	2.6%	81.8%	0.0%	1.0%	0.2%	10.5%
1999-2011	217		0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	2.5%	0.0%	1.5%	0.0%	0.0%	0.0%	2.2%	0.2%	0.4%	9.9%	57.5%	0.0%	2.8%	0.7%	20.6%

[1] Estimates for this year can only be used for distribution of fishing mortalities because the escapement data are insufficient.

Appendix C38. Percent distribution of Salmon River (Oregon Coast) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM															
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	573	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	911	2,3,4	31.5%	0.1%	0.9%	11.6%	0.0%	8.5%	0.0%	0.0%	0.0%	1.1%	1.5%	0.0%	1.2%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	13.9%	29.3%
1981	847	2,3,4,5	23.0%	0.0%	0.5%	26.3%	0.0%	3.9%	0.6%	0.0%	0.0%	0.6%	2.6%	0.0%	0.8%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	14.6%	26.1%
1982	792	2,3,4,5,6	11.0%	1.4%	0.9%	13.9%	0.0%	7.1%	0.0%	0.0%	0.0%	1.0%	0.6%	0.0%	1.1%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	22.3%	39.6%
1983	714	3,4,5,6	21.1%	0.6%	0.0%	15.3%	0.0%	7.6%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	19.6%	34.7%
1984	821	2,4,5,6	13.6%	0.0%	0.0%	18.5%	0.0%	3.5%	0.0%	0.0%	0.0%	3.4%	1.1%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	19.9%	39.2%
1985	663	2,3,5,6	17.6%	1.4%	0.0%	18.1%	0.0%	2.0%	0.0%	0.0%	0.0%	1.4%	0.3%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	20.1%	38.9%
1986	641	2,3,4,6	20.4%	0.0%	0.0%	14.8%	0.0%	3.1%	0.0%	0.0%	0.0%	4.4%	0.5%	0.0%	0.5%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	14.8%	40.9%
1987	849	2,3,4,5	17.2%	0.0%	0.0%	16.4%	0.0%	3.2%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	2.5%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	21.1%	38.0%
1988	1437	2,3,4,5,6	15.2%	1.3%	0.0%	8.4%	0.0%	5.1%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.9%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	13.0%	53.7%
1989	1506	2,3,4,5,6	17.6%	0.0%	0.0%	16.3%	0.0%	4.6%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	3.3%	0.0%	0.4%	0.0%	0.3%	0.0%	0.0%	20.8%	35.5%
1990	1820	2,3,4,5,6	18.3%	2.2%	0.0%	13.0%	1.4%	8.0%	0.0%	0.0%	0.0%	0.3%	0.8%	0.0%	3.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	20.7%	30.8%
1991	2899	2,3,4,5,6	24.2%	0.0%	0.6%	16.6%	0.8%	6.2%	0.0%	0.0%	0.0%	0.1%	0.7%	0.0%	0.2%	0.0%	0.2%	0.0%	0.2%	0.0%	0.0%	22.0%	28.1%
1992	3329	2,3,4,5,6	4.5%	4.3%	0.0%	8.3%	2.0%	16.7%	0.0%	0.0%	0.0%	0.9%	0.3%	0.0%	2.0%	0.0%	0.5%	0.0%	0.2%	0.0%	0.0%	14.2%	45.9%
1993	3009	2,3,4,5,6	9.5%	0.5%	0.2%	15.7%	0.9%	17.6%	0.0%	0.0%	0.0%	0.2%	0.4%	0.0%	2.9%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	28.8%	23.1%
1994	4655	2,3,4,5,6	15.2%	0.6%	1.0%	15.2%	1.9%	4.9%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	1.4%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	16.1%	43.0%
1995	4368	2,3,4,5,6	9.9%	0.4%	0.4%	6.7%	1.2%	1.2%	0.2%	0.0%	0.0%	0.2%	0.1%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	29.3%	50.2%
1996	2383	2,3,4,5,6	20.9%	0.0%	0.0%	2.8%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	45.2%	25.5%
1997	4411	2,3,4,5,6	32.9%	0.0%	1.7%	3.6%	0.4%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	1.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	18.0%	41.5%
1998	3087	2,3,4,5,6	11.8%	1.0%	0.5%	11.9%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	1.0%	0.0%	0.0%	0.0%	0.1%	30.5%	41.3%
1999	2384	2,3,4,5,6	18.2%	0.2%	0.0%	5.7%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	31.3%	37.8%
2000	2920	2,3,4,5,6	17.4%	0.0%	0.7%	3.5%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	19.3%	55.7%
2001	3991	2,3,4,5,6	16.8%	0.0%	1.0%	3.8%	1.7%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	1.6%	0.0%	0.0%	0.0%	0.1%	24.3%	47.3%
2002	5461	2,3,4,5,6	22.4%	0.0%	1.2%	8.0%	2.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	30.9%	31.4%
2003	5113	2,3,4,5,6	15.4%	1.6%	0.7%	6.9%	1.9%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	31.2%	37.6%
2004	5467	2,3,4,5,6	20.8%	1.5%	0.9%	7.9%	4.6%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	21.9%	38.7%
2005	4904	2,3,4,5,6	21.4%	0.0%	1.3%	9.0%	5.6%	2.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.1%	1.3%	0.0%	0.0%	0.0%	0.0%	29.5%	27.8%
2006	2116	2,3,4,5,6	27.1%	0.0%	1.9%	12.7%	6.3%	2.0%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	3.0%	0.0%	0.0%	0.0%	0.1%	24.9%	18.4%
2007	1599	2,3,4,5,6	14.6%	0.0%	1.0%	6.6%	4.8%	0.1%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	35.0%	36.1%
2008	1981	2,3,4,5,6	18.0%	0.0%	1.7%	7.6%	5.5%	0.8%	1.3%	0.0%	0.0%	0.0%	0.3%	0.0%	1.1%	0.0%	0.8%	0.1%	0.0%	0.0%	0.0%	13.0%	50.0%
2009	2690	2,3,4,5,6	20.4%	1.0%	2.0%	14.1%	4.1%	0.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	23.3%	33.3%
2010	4305	2,3,4,5,6	13.6%	0.0%	2.2%	7.5%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.7%	0.1%	0.0%	0.0%	0.0%	42.3%	30.9%
2011	5442	2,3,4,5,6	12.6%	0.0%	0.8%	6.5%	2.4%	2.2%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	30.6%	39.7%
1979-2011	2735		17.9%	0.6%	0.7%	11.0%	1.8%	3.6%	0.3%	0.0%	0.0%	0.5%	0.3%	0.0%	1.2%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	23.8%	37.2%
1979-1984	817		20.1%	0.4%	0.4%	17.1%	0.0%	6.1%	0.1%	0.0%	0.0%	1.3%	1.2%	0.0%	0.7%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	18.1%	33.8%
1985-1995	2289		15.4%	1.0%	0.2%	13.6%	0.7%	6.6%	0.0%	0.0%	0.0%	0.8%	0.4%	0.0%	1.5%	0.0%	0.6%	0.0%	0.1%	0.0%	0.0%	20.1%	38.9%
1996-1998	3294		21.9%	0.3%	0.7%	6.1%	0.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	31.2%	36.1%
1999-2011	3721		18.4%	0.3%	1.2%	7.7%	3.7%	0.8%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	27.5%	37.3%

Appendix C39. Percent distribution of Skagit Summer Fingerling (Skagit Wild) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	5	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	12	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	183	2,3,4	3.8%	0.0%	0.0%	0.0%	1.1%	1.6%	6.6%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	82.5%
1999	189	2,3,4,5	10.6%	1.1%	0.0%	0.0%	0.0%	0.0%	20.6%	0.0%	11.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	55.0%
2000	279	2,3,4,5	9.7%	1.1%	0.0%	0.0%	0.0%	3.2%	7.5%	0.0%	11.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	11.5%	0.0%	0.0%	0.0%	53.8%
2001	866	2,3,4,5	9.2%	3.2%	1.0%	0.0%	1.0%	8.7%	6.5%	0.0%	10.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	2.7%	0.0%	0.5%	0.0%	56.5%
2002	2250	2,3,4,5	13.4%	0.0%	0.9%	1.6%	1.4%	5.9%	1.8%	0.0%	4.3%	0.0%	2.4%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.7%	0.0%	67.4%
2003	875	2,3,4,5	7.0%	0.2%	0.0%	4.2%	3.0%	10.4%	4.6%	0.0%	7.2%	0.0%	0.2%	0.0%	0.3%	0.0%	0.3%	0.5%	0.5%	0.0%	0.2%	0.0%	61.4%
2004	829	2,3,4,5	5.7%	0.0%	0.0%	2.9%	0.7%	11.6%	1.4%	0.0%	1.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	1.0%	0.6%	0.0%	0.0%	0.0%	74.3%
2005	964	2,3,4,5	8.6%	0.3%	0.0%	1.7%	5.7%	7.2%	4.5%	0.0%	2.2%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.1%	1.0%	0.0%	3.6%	0.2%	64.5%
2006	1398	2,3,4,5	3.6%	1.2%	0.2%	0.6%	3.2%	4.3%	3.5%	0.0%	2.5%	0.0%	0.2%	0.0%	0.5%	0.0%	0.0%	0.2%	0.6%	0.0%	3.1%	0.0%	76.2%
2007	1479	2,3,4,5	6.6%	0.9%	0.2%	1.0%	1.1%	8.8%	3.8%	0.0%	0.7%	0.0%	0.1%	0.0%	0.9%	0.0%	0.0%	0.2%	0.6%	0.0%	2.8%	0.0%	72.3%
2008	1124	2,3,4,5	5.5%	0.0%	0.0%	1.5%	1.7%	5.2%	5.9%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	1.5%	0.0%	18.1%	0.0%	58.2%
2009	852	2,3,4,5	7.7%	0.9%	0.9%	1.6%	1.3%	3.5%	8.8%	0.0%	4.3%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%	3.4%	0.0%	33.9%	0.0%	33.1%
2010	565	2,3,4,5	7.8%	0.9%	0.2%	1.6%	4.1%	4.6%	4.2%	0.0%	3.4%	0.0%	0.4%	0.0%	0.9%	0.0%	0.0%	0.7%	3.7%	0.0%	7.3%	0.4%	60.0%
2011	513	3,4,5	4.7%	0.0%	0.6%	0.0%	1.0%	7.0%	7.0%	0.0%	6.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	1.9%	6.4%	0.0%	18.5%	0.0%	45.6%
1979-2011	883		7.4%	0.7%	0.3%	1.2%	1.8%	5.9%	6.2%	0.0%	5.0%	0.0%	0.3%	0.0%	0.4%	0.0%	0.0%	0.5%	2.4%	0.0%	6.4%	0.0%	61.5%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1985-1995	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1996-1998	183		3.8%	0.0%	0.0%	0.0%	1.1%	1.6%	6.6%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	82.5%
1999-2011	937		7.7%	0.8%	0.3%	1.3%	1.9%	6.2%	6.2%	0.0%	5.2%	0.0%	0.3%	0.0%	0.4%	0.0%	0.0%	0.6%	2.5%	0.0%	6.9%	0.0%	59.9%

Appendix C40. Percent distribution of Stillaguamish Fall Fingerling (Stillaguamish Wild) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	15	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	56	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984[1]	109	2,3,4	0.9%	0.0%	0.0%	3.7%	2.8%	10.1%	0.0%	0.0%	13.8%	16.5%	21.1%	0.0%	0.0%	0.0%	0.0%	4.6%	26.6%	0.0%	0.0%	0.0%	0.0%
1985[1]	114	2,3,4,5	7.0%	0.0%	0.0%	4.4%	0.0%	29.8%	8.8%	0.0%	9.6%	0.0%	13.2%	0.0%	0.0%	0.0%	0.0%	8.8%	17.5%	0.0%	0.0%	0.0%	0.9%
1986[1]	96	3,4,5	5.2%	0.0%	0.0%	0.0%	0.0%	32.3%	0.0%	0.0%	20.8%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	15.6%	21.9%	0.0%	0.0%	0.0%	0.0%
1987	42	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	115	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	324	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	421	2,3,4	0.7%	0.0%	0.0%	1.0%	0.2%	20.9%	5.9%	0.7%	11.2%	7.6%	9.5%	0.0%	6.4%	0.0%	0.0%	6.9%	16.2%	0.0%	2.1%	0.0%	10.7%
1991	977	2,3,4,5	0.2%	0.0%	0.0%	0.0%	0.4%	5.4%	2.5%	0.0%	4.8%	0.0%	0.9%	0.0%	4.8%	0.0%	0.0%	3.7%	8.4%	0.0%	1.8%	0.0%	67.0%
1992	936	2,3,4,5	0.0%	0.0%	0.0%	0.4%	0.0%	17.1%	3.5%	0.0%	7.9%	0.0%	4.0%	0.0%	5.4%	0.0%	0.0%	8.7%	38.1%	0.0%	2.2%	0.0%	12.6%
1993	933	2,3,4,5	0.0%	0.0%	0.0%	0.9%	1.1%	13.4%	9.2%	0.3%	9.6%	0.5%	2.1%	0.0%	5.8%	0.0%	0.3%	0.4%	21.4%	0.0%	1.0%	0.0%	33.9%
1994	479	2,3,4,5	2.7%	0.0%	0.0%	0.6%	0.0%	7.3%	5.6%	0.0%	9.2%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	2.1%	7.1%	0.0%	0.2%	0.0%	62.8%
1995	518	2,3,4,5	2.5%	0.0%	0.0%	0.0%	0.0%	3.7%	8.7%	0.0%	6.9%	0.0%	12.2%	0.0%	0.8%	0.0%	0.0%	1.9%	24.5%	0.0%	0.2%	0.0%	38.6%
1996	844	2,3,4,5	1.1%	0.0%	0.0%	0.0%	0.8%	1.1%	6.6%	0.0%	8.3%	0.0%	8.6%	0.0%	0.0%	0.0%	0.0%	0.0%	25.9%	0.0%	0.2%	0.0%	47.3%
1997	852	2,3,4,5	10.1%	0.7%	0.0%	0.2%	1.2%	7.0%	4.8%	0.0%	5.3%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	1.3%	18.7%	0.0%	0.5%	0.0%	48.5%
1998	1099	2,3,4,5	10.4%	0.4%	0.4%	1.7%	0.7%	0.9%	2.5%	0.0%	2.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	1.5%	3.0%	0.0%	0.3%	0.0%	75.9%
1999	684	2,3,4,5	0.7%	1.0%	0.0%	0.0%	0.3%	3.4%	7.7%	0.0%	6.9%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.3%	3.7%	0.0%	0.1%	0.0%	75.4%
2000	980	2,3,4,5	4.4%	0.0%	0.0%	0.0%	0.0%	6.1%	1.4%	0.0%	1.8%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	2.2%	0.0%	0.1%	0.0%	83.5%
2001	309	3,4,5	1.9%	0.0%	0.0%	0.0%	0.0%	5.2%	4.2%	0.0%	[illegible]	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	1.0%	16.2%	0.0%	0.3%	0.0%	66.3%
2002	291	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	13	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	134	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	499	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	823	2,3,4	2.4%	0.1%	0.0%	0.0%	0.9%	11.7%	1.3%	0.0%	3.6%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	1.7%	4.0%	0.0%	0.6%	0.0%	72.9%
2007	819	2,3,4,5	1.0%	1.1%	0.0%	0.0%	0.0%	10.7%	5.9%	0.0%	15.6%	0.0%	1.0%	0.0%	1.8%	0.0%	0.0%	4.0%	9.4%	0.0%	0.6%	0.0%	44.9%
2008	1206	2,3,4,5	2.4%	0.0%	0.0%	0.0%	0.0%	4.8%	5.5%	0.0%	5.9%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.5%	12.0%	0.0%	3.3%	0.0%	65.5%
2009	1025	2,3,4,5	1.2%	0.1%	0.3%	0.4%	0.5%	2.1%	4.2%	0.0%	9.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	1.2%	14.0%	0.0%	3.8%	0.0%	62.5%
2010	861	2,3,4,5	1.0%	0.0%	0.0%	0.0%	6.4%	8.2%	8.2%	0.0%	2.8%	0.1%	0.0%	0.0%	2.3%	0.0%	0.5%	3.5%	9.9%	0.0%	2.4%	0.0%	54.6%
2011	1346	2,3,4,5	1.5%	0.2%	0.0%	0.0%	3.4%	4.8%	7.7%	0.0%	8.8%	0.0%	0.0%	0.0%	0.7%	0.0%	0.2%	1.1%	5.6%	0.0%	1.4%	0.1%	64.4%
1979-2011	735		2.7%	0.2%	0.0%	0.6%	0.9%	10.0%	5.0%	0.0%	8.0%	1.2%	3.9%	0.0%	1.4%	0.0%	0.0%	3.3%	14.6%	0.0%	1.0%	0.0%	47.1%
1979-1984	109		0.9%	0.0%	0.0%	3.7%	2.8%	10.1%	0.0%	0.0%	13.8%	16.5%	21.1%	0.0%	0.0%	0.0%	0.0%	4.6%	26.6%	0.0%	0.0%	0.0%	0.0%
1985-1995	559		2.3%	0.0%	0.0%	0.9%	0.2%	16.2%	5.5%	0.1%	10.0%	1.0%	6.0%	0.0%	2.9%	0.0%	0.0%	6.0%	19.4%	0.0%	0.9%	0.0%	28.3%
1996-1998	932		7.2%	0.4%	0.1%	0.7%	0.9%	3.0%	4.6%	0.0%	5.2%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	0.9%	15.9%	0.0%	0.3%	0.0%	57.2%
1999-2011	895		1.8%	0.3%	0.0%	0.0%	1.3%	6.8%	5.1%	0.0%	6.6%	0.0%	0.2%	0.0%	0.7%	0.0%	0.1%	1.5%	8.6%	0.0%	1.4%	0.0%	65.6%

[1] *Estimates for these years can only be used for distribution of fishing mortalities because the escapement data are insufficient.*

Appendix C41. Percent distribution of Columbia River Summers (Columbia River Summer) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM																	Esc.
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	
1979	197	2,3,4	14.7%	0.0%	1.0%	8.1%	1.5%	17.8%	0.0%	2.5%	4.6%	3.6%	10.2%	0.0%	0.5%	0.0%	4.1%	0.0%	0.0%	0.0%	4.1%	0.0%	27.4%
1980	338	3,4,5	33.4%	0.0%	0.9%	9.2%	0.0%	17.5%	0.0%	0.0%	0.0%	4.1%	1.2%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	31.4%
1981	315	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	24	5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	6	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	35	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	120	2,3,4	13.3%	0.8%	0.0%	5.8%	3.3%	10.8%	0.0%	0.0%	0.0%	2.5%	5.8%	0.0%	21.7%	0.0%	0.8%	0.0%	0.0%	0.0%	6.7%	0.0%	28.3%
1988	317	2,3,4,5	1.6%	3.5%	0.0%	9.1%	1.9%	20.5%	4.1%	0.0%	0.0%	0.0%	8.8%	0.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	2.8%	30.6%
1989	707	2,3,4,5	7.5%	2.8%	0.7%	5.5%	0.6%	16.5%	2.4%	0.0%	1.6%	0.7%	2.4%	0.0%	15.0%	0.0%	2.5%	0.0%	0.0%	0.0%	7.6%	0.0%	34.1%
1990	865	2,3,4,5	10.9%	0.0%	0.0%	7.9%	0.0%	21.0%	0.0%	0.0%	0.6%	1.2%	1.7%	0.0%	5.9%	0.0%	2.4%	0.0%	0.0%	0.0%	10.6%	0.2%	37.6%
1991	607	2,3,4,5	5.1%	0.0%	0.0%	2.8%	0.0%	7.6%	0.8%	0.0%	0.0%	0.7%	3.5%	0.0%	4.3%	0.0%	2.1%	0.0%	0.0%	0.0%	4.9%	0.5%	67.7%
1992	306	2,3,4,5	18.3%	0.0%	0.0%	3.6%	0.0%	15.7%	0.0%	0.0%	0.7%	2.0%	1.0%	0.0%	6.9%	0.0%	0.0%	0.0%	1.6%	0.0%	1.3%	0.0%	49.0%
1993	213	2,3,4,5	8.0%	0.0%	0.0%	1.4%	0.0%	16.0%	1.9%	0.0%	0.0%	0.0%	2.8%	0.0%	5.6%	0.0%	1.4%	0.0%	0.0%	0.0%	3.3%	0.0%	59.6%
1994	38	2,3,4,5	18.4%	0.0%	0.0%	0.0%	15.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.5%	0.0%	55.3%
1995	158	2,3,4,5	3.8%	0.0%	0.0%	0.0%	0.0%	7.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	1.9%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	83.5%
1996	371	2,3,4,5	11.1%	1.1%	0.0%	2.2%	0.3%	3.0%	0.0%	0.0%	3.0%	0.0%	3.8%	0.0%	3.0%	0.0%	0.8%	0.0%	1.3%	0.0%	3.8%	2.2%	64.7%
1997	1264	2,3,4,5	9.1%	0.1%	3.9%	0.2%	1.5%	1.8%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	3.2%	0.0%	0.0%	0.0%	0.2%	0.0%	1.2%	0.5%	77.8%
1998	1546	2,3,4,5	10.0%	0.3%	1.2%	0.1%	2.4%	0.0%	0.6%	0.0%	0.0%	0.0%	0.1%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	1.0%	77.7%
1999	948	2,3,4,5	14.5%	0.7%	3.1%	0.6%	2.6%	0.5%	5.2%	0.0%	0.0%	0.0%	0.4%	0.0%	9.2%	0.0%	0.5%	0.0%	0.0%	0.0%	1.1%	2.7%	58.9%
2000	2790	2,3,4,5	24.6%	1.8%	3.3%	0.6%	2.7%	4.4%	5.2%	0.0%	0.8%	0.0%	0.5%	0.0%	3.2%	0.0%	1.3%	0.1%	0.3%	0.0%	0.9%	2.0%	48.4%
2001	7388	2,3,4,5	15.5%	2.6%	1.4%	0.5%	1.7%	12.9%	2.6%	0.0%	0.2%	0.0%	0.0%	0.0%	16.9%	0.0%	3.6%	0.0%	1.1%	0.0%	0.7%	1.5%	38.7%
2002	11149	2,3,4,5	23.1%	0.0%	1.5%	12.8%	2.0%	14.2%	1.3%	0.0%	0.1%	0.0%	0.0%	0.0%	8.8%	0.0%	3.6%	0.0%	0.0%	0.0%	1.0%	2.2%	29.3%
2003	7858	2,3,4,5	27.6%	0.7%	1.1%	11.9%	2.4%	11.3%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	6.8%	0.0%	1.0%	0.0%	0.1%	0.0%	2.7%	5.6%	28.4%
2004	4868	2,3,4,5	14.4%	0.4%	1.2%	5.4%	1.7%	12.5%	1.4%	0.0%	0.2%	0.0%	0.0%	0.0%	10.7%	0.0%	1.5%	0.0%	0.3%	0.0%	7.4%	14.4%	28.5%
2005	10037	2,3,4,5	9.1%	0.0%	0.6%	6.0%	2.6%	10.4%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.5%	0.0%	0.0%	0.0%	6.8%	7.6%	49.2%
2006	3846	2,3,4,5	12.1%	0.1%	0.5%	3.7%	1.2%	11.2%	1.3%	0.0%	0.0%	0.0%	0.1%	0.0%	3.2%	0.0%	0.4%	0.2%	0.1%	0.0%	12.9%	10.2%	42.7%
2007	5598	2,3,4,5	9.8%	1.9%	1.2%	1.2%	2.2%	5.3%	1.3%	0.0%	0.2%	0.0%	0.8%	0.0%	3.9%	0.0%	0.5%	0.0%	0.5%	0.0%	8.6%	15.7%	46.9%
2008	4743	2,3,4,5	8.8%	0.2%	0.3%	1.0%	1.2%	6.4%	3.2%	0.0%	0.0%	0.0%	0.1%	0.0%	3.0%	0.0%	0.6%	0.0%	0.2%	0.0%	19.2%	10.5%	45.5%
2009	3808	2,3,4,5	8.8%	0.1%	0.4%	1.4%	0.8%	6.2%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.2%	0.0%	0.0%	0.0%	17.5%	6.4%	52.4%
2010	2148	2,3,4,5	8.8%	0.1%	0.6%	1.7%	3.3%	3.4%	0.7%	0.0%	1.3%	0.0%	0.0%	0.0%	4.6%	0.0%	1.0%	0.0%	0.0%	0.0%	20.3%	8.9%	45.3%
2011	1842	2,3,4,5	11.8%	0.3%	0.8%	2.2%	0.7%	4.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	1.2%	0.0%	0.0%	0.0%	23.0%	11.4%	37.7%
1979-2011	2743		13.1%	0.6%	0.9%	3.9%	1.9%	9.5%	1.5%	0.1%	0.5%	0.5%	1.7%	0.0%	5.8%	0.0%	1.1%	0.1%	0.2%	0.0%	7.2%	3.9%	47.3%
1979-1984	268		24.1%	0.0%	1.0%	8.6%	0.8%	17.6%	0.0%	1.3%	2.3%	3.8%	5.7%	0.0%	1.1%	0.0%	2.0%	0.0%	0.0%	0.0%	2.3%	0.0%	29.4%
1985-1995	370		9.7%	0.8%	0.1%	4.0%	2.4%	12.8%	1.0%	0.0%	0.3%	0.8%	3.0%	0.0%	7.2%	0.0%	1.0%	0.3%	0.2%	0.0%	6.5%	0.4%	49.5%
1996-1998	1060		10.1%	0.5%	1.7%	0.8%	1.4%	1.6%	0.2%	0.0%	1.0%	0.0%	1.4%	0.0%	2.7%	0.0%	0.3%	0.0%	0.5%	0.0%	3.2%	1.2%	73.4%
1999-2011	5156		14.5%	0.7%	1.2%	3.8%	1.9%	7.9%	2.3%	0.0%	0.2%	0.0%	0.1%	0.0%	6.3%	0.0%	1.2%	0.0%	0.2%	0.0%	9.4%	7.6%	42.5%

Appendix C42. Percent distribution of Taku River total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	217	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	300	3,4,5	3.7%	3.0%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	89.7%
1981	446	3,4,5,6	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	94.8%
1982	266	3,4,5,6	7.1%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	89.8%
1983	168	3,4,5,6	3.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	95.2%
1984	357	3,4,5,6	10.9%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	87.1%
1985	344	4,5,6	2.9%	0.0%	8.4%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	87.8%
1986	165	5,6	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	50	6	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	69	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	193	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	380	3,4,5	1.1%	2.4%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.9%
1997	650	3,4,5,6	0.6%	3.2%	9.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	86.3%
1998	391	3,4,5,6	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.7%
1999	623	3,4,5,6	2.1%	6.3%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	87.6%
2000	1017	3,4,5,6	2.1%	1.3%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	94.1%
2001	993	3,4,5,6	3.0%	3.6%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	89.9%
2002	870	3,4,5,6	3.3%	3.1%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	85.9%
2003	867	3,4,5,6	2.2%	2.8%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.3%
2004	2158	3,4,5,6	3.4%	6.7%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	86.6%
2005	1285	3,4,5,6	2.8%	33.2%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.6%
2006	902	3,4,5,6	3.5%	17.8%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.3%
2007	410	3,4,5,6	7.6%	12.7%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	78.5%
2008	635	3,4,5,6	5.0%	4.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	90.6%
2009	356	3,4,5,6	7.0%	12.6%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.8%
2010	324	3,4,5,6	3.1%	1.5%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.8%
2011	301	3,4,5,6	7.6%	6.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.4%
1979-2011	638		4.0%	5.8%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	87.3%
1979-1984	307		6.0%	2.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	91.3%
1985-1995	344		2.9%	0.0%	8.4%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	87.8%
1996-1998	474		1.0%	1.9%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.0%
1999-2011	826		4.1%	8.6%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	84.4%

Appendix C43. Percent distribution of Unuk River total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM							ISBM															Esc.
			SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal					
			Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport			
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1980	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1981	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1982	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1983	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1984	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1985	44	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1986	645	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1987	431	3,4,5	11.1%	0.5%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			84.7%
1988	442	3,4,5,6	6.8%	1.1%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			91.0%
1989	269	3,4,5,6	9.7%	2.2%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			86.2%
1990	180	4,5,6	27.8%	0.6%	11.7%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			57.2%
1991	138	5,6	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1992	144	6	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1993	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1994	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1995	2	3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1996	35	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
1997	173	3,4,5	10.4%	8.7%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			76.3%
1998	488	3,4,5,6	9.4%	2.9%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			84.0%
1999	773	3,4,5,6	7.5%	1.0%	12.9%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			76.3%
2000	1111	3,4,5,6	10.9%	2.8%	9.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			74.3%
2001	1413	3,4,5,6	8.0%	0.7%	6.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			84.6%
2002	958	3,4,5,6	8.6%	0.6%	5.9%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			83.7%
2003	714	3,4,5,6	11.3%	0.1%	8.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			78.6%
2004	732	3,4,5,6	6.6%	15.8%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			73.5%
2005	733	3,4,5,6	21.0%	2.5%	11.2%	0.3%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			62.5%
2006	813	3,4,5,6	10.9%	7.6%	6.6%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			73.9%
2007	667	3,4,5,6	16.3%	7.0%	3.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			71.4%
2008	353	3,4,5,6	15.0%	4.2%	1.1%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			76.8%
2009	397	3,4,5,6	14.6%	1.5%	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			77.8%
2010	415	3,4,5,6	20.2%	1.0%	7.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			71.1%
2011	275	4,5,6	19.6%	3.6%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			72.7%
1979-2011	597		12.9%	3.4%	5.8%	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			76.7%
1979-1984	0		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%
1985-1995	330		13.8%	1.1%	4.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			79.8%
1996-1998	330		9.9%	5.8%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			80.2%
1999-2011	720		13.1%	3.7%	6.6%	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			75.2%

Appendix C44. Percent distribution of Columbia River Upriver Bright (Columbia River Upriver Brights) total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM													
	# of		SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	5547	2,3,4	18.4%	0.3%	0.6%	7.7%	0.1%	12.9%	0.0%	0.4%	0.1%	4.0%	4.4%	0.0%	1.3%	0.1%	1.2%	0.1%	0.3%	0.0%	22.4%	0.5%	25.4%
1980	3703	2,3,4,5	20.8%	0.8%	0.6%	6.7%	0.1%	7.5%	0.0%	0.5%	0.6%	1.6%	1.9%	0.0%	1.1%	0.0%	0.8%	0.0%	0.4%	0.0%	6.3%	0.7%	49.5%
1981	2335	2,3,4,5	17.1%	0.2%	0.4%	5.7%	0.0%	4.0%	0.2%	0.2%	0.2%	1.1%	1.8%	0.0%	0.6%	0.0%	0.9%	0.0%	0.2%	0.0%	3.6%	0.0%	63.9%
1982	1436	2,3,4,5	9.0%	0.4%	0.3%	4.0%	0.2%	5.2%	0.0%	0.0%	0.0%	0.3%	1.6%	0.0%	0.8%	0.0%	0.7%	0.0%	0.0%	0.0%	2.6%	0.0%	75.0%
1983	970	2,3,4,5	22.4%	0.3%	0.0%	11.1%	0.2%	3.9%	0.0%	0.0%	0.2%	2.0%	3.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	48.4%
1984	1833	2,3,4,5	20.2%	1.0%	0.2%	10.3%	0.2%	8.3%	0.3%	0.0%	0.2%	2.3%	1.6%	0.0%	0.2%	0.0%	0.0%	0.0%	0.8%	0.0%	17.1%	1.0%	36.3%
1985	2726	2,3,4,5	14.2%	2.3%	0.1%	7.3%	0.0%	6.8%	0.2%	0.0%	0.1%	0.1%	3.1%	0.0%	0.5%	0.0%	0.5%	0.0%	0.4%	0.0%	30.1%	2.5%	31.7%
1986	3139	2,3,4,5	8.7%	1.2%	0.1%	6.5%	0.1%	10.6%	0.2%	0.0%	0.2%	1.4%	1.8%	0.0%	1.6%	0.0%	0.3%	0.1%	0.7%	0.0%	32.0%	2.5%	32.0%
1987	3741	2,3,4,5	17.4%	1.6%	0.4%	11.7%	0.1%	7.9%	0.5%	0.0%	0.0%	1.8%	0.6%	0.0%	1.4%	0.1%	0.5%	0.0%	0.2%	0.0%	34.0%	2.9%	19.0%
1988	3051	2,3,4,5	10.9%	1.6%	0.4%	8.6%	0.0%	11.7%	0.0%	0.0%	0.0%	0.6%	0.6%	0.0%	1.9%	0.0%	0.6%	0.1%	0.2%	0.0%	43.0%	2.2%	17.5%
1989	1326	2,3,4,5	14.6%	0.0%	0.2%	15.2%	0.5%	8.1%	0.0%	0.0%	0.0%	0.2%	1.4%	0.0%	1.2%	0.0%	0.3%	0.0%	0.0%	0.0%	40.7%	1.6%	16.0%
1990	712	2,3,4,5	14.0%	0.0%	1.1%	10.8%	0.0%	8.7%	0.0%	0.0%	0.0%	0.8%	0.7%	0.0%	1.3%	0.0%	0.4%	0.0%	0.8%	0.0%	33.0%	1.1%	27.1%
1991	301	2,3,4,5	8.0%	2.3%	3.3%	6.6%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.3%	4.0%	44.5%
1992	333	2,3,4,5	3.6%	1.5%	0.0%	3.6%	0.0%	12.3%	1.2%	0.0%	0.0%	0.0%	3.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	18.0%	6.0%	50.2%
1993	602	2,3,4,5	15.3%	0.0%	0.0%	7.6%	0.5%	19.4%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	1.7%	0.0%	1.2%	0.0%	0.7%	0.0%	14.3%	4.2%	34.9%
1994	984	2,3,4,5	11.0%	2.5%	0.0%	8.1%	1.2%	7.1%	0.6%	0.0%	0.0%	0.2%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.9%	3.4%	46.0%
1995	748	2,3,4,5	9.9%	0.4%	2.4%	2.7%	0.0%	7.1%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.7%	0.0%	0.8%	0.0%	0.0%	0.0%	10.4%	3.6%	61.5%
1996	800	2,3,4,5	4.5%	0.0%	0.0%	1.4%	0.3%	0.8%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.8%	0.0%	0.0%	0.0%	0.4%	0.0%	22.6%	5.3%	63.9%
1997	1055	2,3,4,5	13.4%	0.7%	3.2%	5.0%	0.9%	0.5%	0.1%	0.0%	0.0%	0.6%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	20.2%	10.0%	44.5%
1998	747	2,3,4,5	10.8%	4.3%	2.9%	2.4%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.3%	9.0%	54.8%
1999	1425	2,3,4,5	14.2%	0.0%	2.7%	7.7%	0.8%	0.0%	0.4%	0.0%	0.5%	0.0%	0.0%	0.0%	0.6%	0.0%	0.1%	0.0%	0.0%	0.0%	13.5%	8.0%	51.4%
2000	961	2,3,4,5	25.2%	0.1%	3.0%	0.0%	0.0%	1.5%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.2%	0.0%	0.0%	0.0%	19.5%	4.5%	42.5%
2001	1339	2,3,4,5	6.3%	0.0%	1.3%	0.0%	0.7%	1.1%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.4%	0.0%	0.0%	0.0%	16.5%	8.4%	62.3%
2002	1789	2,3,4,5	16.5%	0.0%	2.7%	1.8%	0.9%	1.6%	0.7%	0.0%	0.6%	0.0%	1.5%	0.0%	1.9%	0.0%	1.0%	0.0%	0.0%	0.0%	17.4%	8.6%	44.7%
2003	2364	2,3,4,5	14.2%	1.3%	0.5%	5.5%	1.2%	0.8%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.5%	0.0%	0.0%	0.0%	15.1%	6.9%	52.9%
2004	2501	2,3,4,5	11.0%	2.0%	0.5%	3.8%	1.8%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	1.5%	0.0%	0.2%	0.0%	15.9%	6.3%	53.9%
2005	2636	2,3,4,5	14.9%	1.4%	0.9%	9.4%	5.3%	3.4%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	1.3%	0.0%	0.0%	0.0%	13.5%	7.0%	39.6%
2006	1716	2,3,4,5	13.9%	1.7%	1.4%	6.9%	1.9%	1.5%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.4%	0.0%	0.3%	0.0%	13.1%	15.3%	40.1%
2007	639	2,3,4,5	10.6%	0.2%	1.1%	5.2%	5.5%	1.1%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	1.4%	0.0%	0.0%	0.0%	13.3%	20.7%	40.1%
2008	892	2,3,4,5	13.1%	0.6%	0.0%	2.9%	1.9%	1.9%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.8%	0.0%	0.0%	0.0%	19.3%	8.2%	46.2%
2009	1448	2,3,4,5	20.5%	1.6%	1.7%	8.6%	1.6%	0.6%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	1.0%	0.0%	1.2%	0.0%	24.3%	6.1%	30.7%
2010	1796	2,3,4,5	5.0%	0.4%	2.6%	1.7%	1.2%	0.8%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	2.3%	0.0%	0.0%	0.0%	20.4%	5.1%	56.9%
2011	3165	2,3,4,5	10.0%	0.2%	0.7%	2.8%	3.1%	1.5%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.9%	0.0%	0.0%	0.0%	26.5%	10.4%	39.8%
1979-2011	1781		13.3%	0.9%	1.1%	6.0%	0.9%	5.2%	0.7%	0.0%	0.1%	0.5%	0.9%	0.0%	1.0%	0.0%	0.6%	0.0%	0.2%	0.0%	19.4%	5.3%	43.7%
1979-1984	2637		18.0%	0.5%	0.3%	7.6%	0.1%	7.0%	0.1%	0.2%	0.2%	1.9%	2.5%	0.0%	0.7%	0.0%	0.6%	0.0%	0.3%	0.0%	10.0%	0.4%	49.7%
1985-1995	1606		11.6%	1.2%	0.7%	8.1%	0.2%	10.0%	0.2%	0.0%	0.0%	0.5%	1.2%	0.0%	1.0%	0.0%	0.5%	0.0%	0.3%	0.0%	26.8%	3.1%	34.6%
1996-1998	867		9.6%	1.6%	2.1%	2.9%	0.5%	0.5%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.6%	0.0%	0.0%	0.0%	0.1%	0.0%	19.4%	8.1%	54.4%
1999-2011	1744		13.5%	0.7%	1.5%	4.3%	2.0%	1.4%	1.5%	0.0%	0.1%	0.0%	0.1%	0.0%	1.2%	0.0%	0.9%	0.0%	0.1%	0.0%	17.6%	8.9%	46.2%

Appendix C45. Percent distribution of White River Spring Yearling (Puget Sound Hatchery Yearling) total fishing mortalities among fisheries and escapement.

Catch Year	Estimated # of CWTs	Ages Present	AABM SEAK Troll	AABM SEAK Net	AABM SEAK Sport	AABM NBC Troll	AABM NBC Sport	AABM WCVI Troll	AABM WCVI Sport	ISBM Geo St Troll	ISBM Geo St Sport	ISBM Canada Troll	ISBM Canada Net	ISBM Canada Sport	ISBM WA/OR coast Troll	ISBM WA/OR coast Net	ISBM WA/OR coast Sport	ISBM Puget Sound Net	ISBM Puget Sound Sport	ISBM Terminal Troll	ISBM Terminal Net	ISBM Terminal Sport	Esc.
1979	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	1	2,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	9	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1982[1]	108	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	1.9%	0.9%	0.0%	0.0%	0.9%	0.0%	0.0%	54.6%	34.3%	0.0%	5.6%	0.0%	0.9%
1983	212	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	1.4%	0.0%	0.0%	10.4%	63.7%	0.0%	0.0%	0.0%	18.9%
1984[1]	231	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	4.3%	0.0%	4.8%	0.0%	0.0%	1.7%	0.0%	0.0%	3.5%	45.5%	0.0%	4.3%	0.0%	32.0%
1985	442	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	25.3%	60.9%	0.0%	0.0%	0.0%	9.5%
1986	961	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	2.3%	0.4%	2.0%	0.0%	0.4%	0.0%	0.0%	14.0%	56.7%	0.0%	0.0%	0.0%	23.[illegible]%
1987	724	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.4%	0.0%	2.5%	0.0%	0.0%	8.1%	62.2%	0.0%	0.0%	0.0%	25.7%
1988	1837	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.8%	0.0%	2.9%	0.0%	0.2%	0.0%	1.4%	0.0%	0.2%	12.5%	52.4%	0.0%	0.0%	0.0%	29.3%
1989	1018	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	1.4%	0.0%	1.0%	0.0%	6.3%	0.0%	0.2%	11.6%	46.6%	0.0%	0.3%	0.0%	31.4%
1990	518	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.6%	0.0%	0.6%	0.0%	5.8%	0.0%	0.0%	13.9%	48.3%	0.0%	0.4%	0.0%	28.4%
1991	466	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	1.5%	0.0%	1.5%	0.0%	0.0%	0.0%	4.1%	0.0%	0.0%	9.7%	46.1%	0.0%	0.0%	0.0%	36.3%
1992	862	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	0.7%	0.0%	2.1%	0.0%	2.6%	0.0%	2.7%	0.0%	0.5%	6.7%	48.7%	0.0%	0.7%	0.0%	32.7%
1993	323	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	2.5%	39.3%	0.0%	0.6%	0.0%	53.9%
1994	251	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	1.6%	51.4%	0.0%	0.0%	0.0%	43.8%
1995	474	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	41.6%	0.0%	0.0%	0.0%	56.8%
1996	382	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	48.7%	0.0%	0.0%	0.0%	49.7%
1997	319	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	49.8%	0.0%	0.0%	0.0%	46.7%
1998	139	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	1.4%	33.8%	0.0%	0.0%	0.0%	63.3%
1999	106	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.3%	0.0%	0.0%	0.0%	50.0%
2000	97	3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	44.3%	0.0%	0.0%	0.0%	48.5%
2001	57	4,5	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	No Data		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	223	2	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	1081	2,3	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	1129	2,3,4	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.1%	0.2%	18.0%	0.0%	1.8%	0.0%	76.3%
2007	917	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.4%	0.2%	21.9%	0.0%	2.2%	0.0%	73.9%
2008	238	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	8.0%	0.0%	5.5%	0.0%	84.0%
2009	210	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	2.4%	0.0%	83.3%
2010	213	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	8.0%	0.0%	87.8%
2011	217	2,3,4,5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.0%	0.0%	94.0%
1979-2011	496		0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.2%	0.2%	0.9%	0.2%	0.5%	0.0%	1.4%	0.0%	0.1%	7.3%	39.4%	0.0%	1.5%	0.0%	47.2%
1979-1984	184		0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	0.0%	1.4%	0.6%	1.9%	0.5%	0.0%	1.4%	0.0%	0.0%	22.8%	47.8%	0.0%	3.3%	0.0%	17.3%
1985-1995	716		0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.4%	0.0%	1.5%	0.0%	0.9%	0.0%	2.4%	0.0%	0.1%	9.7%	50.4%	0.0%	0.2%	0.0%	33.8%
1996-1998	280		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.7%	44.1%	0.0%	0.0%	0.0%	53.3%
1999-2011	391		0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.3%	0.0%	0.1%	0.4%	19.3%	0.0%	3.2%	0.0%	74.7%

[1] Estimates for this year can only be used for distribution of fishing mortalities because the escapement data are insufficient.

Appendix C46. Percent distribution of Willamette Spring (Willamette River Hatchery) total fishing mortalities among fisheries and escapement.

Catch	Estimated	Ages	AABM							ISBM													
	# of		SEAK			NBC		WCVI		Geo St		Canada			WA/OR coast			Puget Sound		Terminal			
Year	CWTs	Present	Troll	Net	Sport	Troll	Sport	Troll	Sport	Troll	Sport	Troll	Net	Sport	Troll	Net	Sport	Net	Sport	Troll	Net	Sport	Esc.
1979	2296	3,4	Failed	Criteria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	6096	3,4,5	5.0%	0.8%	0.2%	7.3%	0.1%	3.2%	0.0%	0.0%	0.0%	0.2%	0.5%	0.0%	0.7%	0.0%	0.8%	0.0%	0.0%	0.0%	0.3%	7.8%	73.1%
1981	8354	3,4,5,6	5.8%	0.5%	0.1%	7.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	0.4%	0.0%	0.3%	0.0%	0.0%	0.0%	1.6%	10.5%	71.7%
1982	3956	3,4,5,6	5.7%	1.1%	0.1%	7.6%	0.1%	4.7%	0.0%	0.0%	0.0%	0.1%	0.4%	0.0%	1.3%	0.0%	1.9%	0.2%	0.2%	0.0%	6.9%	24.0%	45.8%
1983	2862	3,4,5,6	18.8%	0.1%	0.0%	13.0%	0.0%	2.0%	0.0%	0.5%	0.3%	0.3%	0.0%	0.0%	2.1%	0.0%	0.5%	0.0%	0.7%	0.0%	5.8%	20.1%	36.0%
1984	4144	3,4,5,6	4.9%	0.2%	0.4%	2.5%	0.1%	2.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%	1.1%	0.0%	0.0%	0.0%	0.2%	0.0%	6.5%	25.5%	56.1%
1985	2900	3,4,5,6	7.1%	0.2%	0.0%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%	0.2%	0.0%	0.0%	16.1%	27.2%	47.7%
1986	760	3,4,5,6	4.3%	0.4%	0.0%	7.2%	0.0%	6.1%	0.7%	0.0%	0.0%	0.7%	2.5%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	8.4%	20.5%	48.4%
1987	801	3,4,5,6	18.1%	0.0%	1.0%	15.6%	0.0%	1.5%	1.2%	0.0%	0.0%	1.2%	1.0%	0.0%	3.1%	0.0%	0.0%	0.0%	0.6%	0.0%	5.4%	22.3%	28.8%
1988	2177	3,4,5,6	11.9%	0.4%	0.6%	8.1%	0.0%	3.9%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	2.4%	0.0%	0.2%	0.0%	0.0%	0.0%	6.8%	27.6%	37.3%
1989	2783	3,4,5,6	5.7%	0.0%	0.3%	2.2%	0.0%	1.7%	0.6%	0.0%	0.7%	0.0%	0.3%	0.0%	1.8%	0.0%	0.2%	0.0%	0.1%	0.0%	12.4%	20.4%	53.6%
1990	2826	3,4,5,6	10.1%	0.8%	0.3%	2.0%	0.4%	2.7%	0.7%	0.0%	0.0%	0.2%	0.6%	0.0%	1.5%	0.0%	0.1%	0.0%	0.0%	0.0%	16.0%	26.7%	37.9%
1991	3028	3,4,5,6	4.3%	2.0%	0.7%	2.1%	0.0%	0.4%	0.2%	0.0%	0.3%	0.0%	0.2%	0.0%	0.8%	0.0%	0.2%	0.0%	0.0%	0.0%	6.0%	42.7%	40.1%
1992	2883	3,4,5,6	7.1%	6.5%	0.2%	2.0%	0.2%	3.1%	0.2%	0.0%	0.0%	0.0%	0.3%	0.0%	2.7%	0.0%	0.4%	0.0%	0.6%	0.0%	5.3%	28.3%	43.1%
1993	5368	3,4,5,6	13.0%	0.0%	0.0%	1.6%	0.1%	1.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.1%	0.0%	0.0%	0.0%	0.8%	42.0%	38.9%
1994	5055	3,4,5,6	5.8%	1.1%	1.1%	0.9%	0.1%	0.9%	0.0%	0.0%	0.0%	0.3%	0.2%	0.0%	0.2%	0.0%	0.1%	0.0%	0.1%	0.0%	5.0%	38.6%	45.6%
1995	4474	3,4,5,6	5.2%	0.3%	0.4%	1.5%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	43.7%	47.3%
1996	3728	3,4,5,6	2.4%	0.0%	0.0%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.8%	34.4%	61.7%
1997	2274	3,4,5,6	4.8%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	16.4%	77.3%
1998	1593	3,4,5,6	5.8%	0.3%	0.3%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	17.1%	75.5%
1999	1852	3,4,5,6	9.4%	0.0%	0.9%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.8%	14.6%	73.2%
2000	70[illegible]	3,4,5,6	14.0%	0.1%	1.0%	0.2%	0.7%	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	2.3%	28.9%	51.2%
2001	35106	3,4,5,6	1.7%	0.0%	0.1%	0.1%	0.1%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.2%	0.0%	3.8%	24.6%	68.6%
2002	19942	3,4,5,6	2.3%	0.1%	0.1%	1.1%	0.1%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.3%	0.0%	0.0%	0.0%	15.6%	20.9%	58.0%
2003	6970	3,4,5,6	6.1%	0.0%	0.1%	0.5%	0.2%	2.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	1.5%	16.2%	72.2%
2004	7098	3,4,5,6	3.9%	0.5%	0.1%	0.7%	0.0%	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%	21.0%	59.6%
2005	3044	3,4,5,6	3.3%	0.0%	0.1%	0.3%	0.3%	5.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.1%	0.0%	0.1%	0.0%	5.2%	16.2%	67.7%
2006	2008	3,4,5,6	4.3%	0.0%	0.0%	0.4%	0.7%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.4%	0.0%	7.9%	25.2%	55.0%
2007	1609	3,4,5,6	5.5%	0.3%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%	18.6%	68.4%
2008	2317	3,4,5,6	2.0%	0.1%	0.1%	0.5%	0.0%	1.2%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	20.1%	12.6%	62.7%
2009	4079	3,4,5,6	4.0%	0.1%	0.0%	0.3%	0.4%	0.9%	3.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.4%	0.0%	0.2%	0.0%	0.5%	0.0%	8.8%	20.2%	60.0%
2010	11749	3,4,5,6	3.1%	0.0%	0.1%	0.5%	0.3%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.2%	0.0%	0.2%	0.0%	3.9%	33.4%	55.4%
2011	8175	3,4,5,6	4.5%	0.0%	0.3%	0.9%	0.3%	1.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	1.2%	0.0%	0.3%	0.0%	0.3%	0.0%	5.4%	41.9%	43.5%
1979-2011	5535		6.6%	0.5%	0.3%	2.7%	0.1%	1.9%	0.3%	0.0%	0.1%	0.1%	0.2%	0.0%	1.0%	0.0%	0.2%	0.0%	0.2%	0.0%	6.0%	24.7%	55.0%
1979-1984	5082		8.0%	0.5%	0.2%	7.5%	0.1%	2.7%	0.0%	0.1%	0.1%	0.2%	0.2%	0.0%	1.1%	0.0%	0.7%	0.0%	0.2%	0.0%	4.2%	17.6%	56.5%
1985-1995	3005		8.4%	1.1%	0.4%	4.0%	0.1%	2.1%	0.4%	0.0%	0.1%	0.3%	0.5%	0.0%	1.3%	0.0%	0.2%	0.0%	0.2%	0.0%	7.5%	30.9%	42.6%
1996-1998	2532		4.3%	0.1%	0.1%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	0.0%	0.7%	22.6%	71.5%
1999-2011	8542		4.9%	0.1%	0.2%	0.4%	0.2%	2.0%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.8%	0.0%	0.1%	0.0%	0.1%	0.0%	6.7%	22.6%	61.2%

APPENDIX D: MODEL ESTIMATES OF THE STOCK COMPOSITION OF THE AABM AND THREE ISBM OCEAN FISHERIES FOR 2012 AND THE AVERAGE, 1985–2011.

This appendix shows the model estimates of the stock composition of the catch for the three AABM fisheries (Appendices D1, D2 and D4), and three ISBM ocean fisheries (Appendices D3, D5 and D6). These estimates are based on the summation of the contribution of the 30 model stocks for each fishery, expressed as a percentage of the total catch.

The estimated stock composition may not reflect the true stock composition in a given year for several reasons:

1. The yearly catch estimates by stock are influenced by the base period stock composition in a fishery which may not reflect the current stock composition in the fishery, amongst the 30 model stocks.
2. The distribution of certain stocks may have changed over time.
3. The 30 model stocks do not represent all production present in a fishery.

For example, in the SEAK fishery a substantial component (over 20%) of the catch is comprised of Alaska hatchery fish, most of which do not count as treaty catch and are not included in Appendix D1. Also, in the sport fishery portion of the present NBC AABM fishery, the base period data used is from fisheries which were located near shore and do not represent the current stock composition of the sport fishery which is located offshore.

Hence, these tables do not necessarily portray the true stock composition of the total catch fisheries in Appendices D1 to D6. There are genetic estimates for most of these fisheries in selected years which can provide more accurate accounting of contributions by stocks or stock groups.

LIST OF APPENDIX D TABLES

Appendix D1. Southeast Alaska all gear.

FISHERY	SE ALASKA ALL GEAR [1]				
	2012	Average (1985–2011)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Total Return	Associated Escapement Indicator Stocks[2]
North/Central B.C.	10.91%	16.29%	21.00%	10.14%	Yakoun Nass Skeena Area 6 Index Area 8 Index Rivers Inlet Smith Inlet
Columbia Upriver Bright	22.43%	16.04%	27.06%	13.25%	Columbia Upriver Bright
WCVI Hatchery	13.23%	15.54%	48.63%	16.89%	NA
Oregon Coastal North Migrating	12.70%	14.46%	35.68%	15.86%	Oregon Coastal
Fraser Early	5.49%	6.01%	30.96%	7.37%	Upper Fraser Middle Fraser Thompson
Mid-Columbia Brights	8.19%	5.67%	33.75%	13.48%	Not Represented
Upper Strait of Georgia	5.66%	4.46%	33.33%	19.6[illegible]%	Upper Strait of Georgia
Alaska South SE	2.05%	3.69%	96.45%	34.49%	King Salmon Andrew Creek Blossom Keta Unuk Chickamin
Washington Coastal Wild	3.01%	3.35%	20.07%	10.87%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall
WCVI Wild	1.54%	3.15%	49.57%	17.00%	WCVI
Columbia Upriver Summer	6.50%	3.14%	33.53%	14.45%	Columbia Upriver Summer
WA Coastal Hatchery	2.83%	2.76%	18.61%	10.15%	NA
Willamette River Hatchery	2.56%	2.21%	11.73%	5.08%	NA
Fall Cowlitz Hatchery	0.30%	0.98%	5.32%	2.04%	NA
Lewis River Wild	0.93%	0.81%	18.03%	7.80%	Lewis River
Lower Strait of Georgia Hatchery	0.17%	0.35%	3.57%	1.82%	NA
Lower Strait of Georgia	0.20%	0.21%	3.85%	2.03%	Lower Strait of Georgia
Fraser Late	0.10%	0.18%	0.38%	0.14%	Harrison
Puget Sound Hatchery Fingerling	0.23%	0.18%	0.46%	0.25%	NA
Snake River Fall	0.63%	0.14%	8.63%	5.20%	Not Represented
Skagit Summer/Fall	0.02%	0.08%	3.63%	1.02%	Skagit Summer/Fall
Spring Cowlitz Hatchery	0.08%	0.08%	1.60%	0.83%	NA
Stillaguamish Summer/Fall	0.08%	0.06%	17.36%	6.54%	Stillaguamish
Puget Sound Yearling	0.07%	0.05%	0.49%	0.32%	NA
Snohomish Summer/Fall	0.04%	0.04%	2.77%	1.11%	Snohomish
Nooksack Fall	0.03%	0.04%	0.15%	0.11%	NA
Puget Sound Natural	0.03%	0.04%	0.55%	0.26%	Green
Lower Bonneville Hatchery	0.00%	0.00%	0.00%	0.00%	NA
Spring Creek Hatchery	0.00%	0.00%	0.00%	0.00%	NA
Nooksack Spring	0.00%	0.00%	0.00%	0.00%	Not Represented

[1] In the SEAK AABM fishery a substantial component (over 20%) of the catch is comprised of Alaska hatchery Chinook, most of which do not count as treaty catch and none of which appear in the table above. A small portion of Alaska hatchery Chinook are accounted for in the SEAK treaty catch (5,000 fish + the "risk adjustment factor" which is 1.645 × the SE of the total Alaska hatchery catch which has averaged about 2,000 fish in recent years). Additionally, the model can only account for or "explain" about 83% of the SEAK catch, i.e., attribute 83% of the catch to the 30 model stocks. The 17% not explained by the model is likely comprised mostly of wild stocks from the SEAK region either not included in the present 30 models stocks (Situk Alsek, Chilkat, Taku and Stikine) or various other local stocks which are not enumerated. Therefore, in addition to excluding most of the Alaska hatchery Chinook,the stock composition in Appendix D1 includes no provision for the 17% of the catch not explainedby the model.

[2] NA = denotes a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D2. North B.C. troll and sport.

FISHERY	NORTH TROLL AND SPORT [1]				
	2012	Average (1985–2011)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	Associated Escapement Indicator Stocks [2]
North/Central B.C.	59.80%	54.00%	70.62%	37.72%	Yakoun Nass Skeena Area 6 Index Area 8 Index Rivers Inlet Smith Inlet
Oregon Coastal North Migrating	6.21%	11.03%	27.05%	12.95%	Oregon Coastal
Columbia Upriver Bright	6.04%	5.84%	10.68%	5.44%	Columbia Upriver Bright
WCVI Hatchery	2.31%	4.94%	15.06%	5.66%	NA
Upper Strait of Georgia	7.26%	4.35%	37.16%	22.08%	Upper Strait of Georgia
Fraser Early	2.25%	2.82%	16.37%	4.39%	Upper Fraser Middle Fraser Thompson
Willamette River Hatchery	1.99%	2.79%	14.75%	6.59%	NA
Washington Coastal Wild	1.36%	2.42%	14.41%	8.32%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall
Columbia Upriver Summer	4.23%	2.00%	24.41%	11.01%	Columbia Upriver Summer
WA Coastal Hatchery	1.32%	1.94%	13.63%	7.79%	NA
Mid-Columbia Brights	1.95%	1.82%	12.91%	5.43%	Not Represented
WCVI Wild	0.26%	1.07%	15.24%	5.66%	WCVI
Lower Strait of Georgia Hatchery	0.46%	0.86%	10.13%	5.14%	NA
Fall Cowlitz Hatchery	0.81%	0.80%	4.45%	1.84%	NA
Fraser Late	0.57%	0.76%	1.64%	0.67%	Harrison
Lower Strait of Georgia	0.45%	0.45%	9.91%	5.36%	Lower Strait of Georgia
Nooksack Fall	0.64%	0.41%	2.14%	1.52%	NA
Skagit Summer/Fall	0.32%	0.33%	16.77%	4.84%	Skagit Summer/Fall
Puget Sound Hatchery Fingerling	0.47%	0.30%	0.91%	0.51%	NA
Lewis River Wild	0.20%	0.28%	5.93%	2.87%	Lewis River
Spring Cowlitz Hatchery	0.17%	0.21%	4.62%	2.54%	NA
Puget Sound Yearling	0.37%	0.17%	2.30%	1.49%	NA
Snohomish Summer/Fall	0.13%	0.16%	12.18%	4.82%	Snohomish
Alaska South SE	0.03%	0.08%	2.40%	0.85%	King Salmon Andrew Creek Blossom Keta Unuk Chickamin
Snake River Fall	0.29%	0.07%	5.91%	3.77%	Not Represented
Puget Sound Natural	0.04%	0.06%	0.99%	0.46%	Green
Stillaguamish Summer/Fall	0.05%	0.03%	11.48%	4.31%	Stillaguamish
Spring Creek Hatchery	0.01%	0.01%	0.05%	0.04%	NA
Nooksack Spring	0.00%	0.00%	1.77%	0.55%	Nooksack
Lower Bonneville Hatchery	0.00%	0.00%	0.00%	0.00%	NA

[1] In the sport fishery portion of the present NBC AABM fishery, the base period data used is from fisheries which were located near shore and do not represent the current stock composition of the sport fishery which is located offshore.

[2] NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D3. Central B.C. troll.

FISHERY	CENTRAL TROLL				
	2012	Average (1985–2011)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	Associated Escapement Indicator Stocks[1]
Fraser Late	0.00%	15.66%	1.56%	0.86%	Harrison
WCVI Hatchery	0.00%	13.75%	2.66%	1.09%	NA
Columbia Upriver Bright	0.00%	6.43%	0.67%	0.39%	Columbia Upriver Bright
North/Central B.C.	0.00%	5.45%	0.74%	0.31%	Yakoun Nass Skeena Area 6 Index Area 8 Index Rivers Inlet Smith Inlet
Upper Strait of Georgia	0.00%	4.61%	2.49%	1.60%	Upper Strait of Georgia
WCVI Wild	0.00%	3.12%	2.62%	1.08%	WCVI
Columbia Upriver Summer	0.00%	2.92%	2.63%	1.24%	Columbia Upriver Summer
Washington Coastal Wild	0.00%	2.63%	0.85%	0.56%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall
Fraser Early	0.00%	2.63%	0.74%	0.26%	Upper Fraser Middle Fraser Thompson
Lower Strait of Georgia Hatchery	0.00%	2.31%	1.04%	0.71%	NA
WA Coastal Hatchery	0.00%	2.09%	0.79%	0.51%	NA
Mid-Columbia Brights	0.00%	2.08%	0.79%	0.40%	Not Represented
Oregon Coastal North Migrating	0.00%	1.98%	0.27%	0.14%	Oregon Coastal
Lower Bonneville Hatchery	0.00%	1.76%	0.72%	0.36%	NA
Lower Strait of Georgia	0.00%	1.39%	0.99%	0.70%	Lower Strait of Georgia
Puget Sound Hatchery Fingerling	0.00%	1.36%	0.19%	0.13%	NA
Nooksack Fall	0.00%	1.34%	0.27%	0.22%	NA
Skagit Summer/Fall	0.00%	0.94%	1.62%	0.67%	Skagit Summer/Fall
Lewis River Wild	0.00%	0.70%	0.46%	0.25%	Lewis River
Snohomish Summer/Fall	0.00%	0.59%	1.11%	0.69%	Snohomish
Puget Sound Yearling	0.00%	0.55%	0.29%	0.22%	NA
Spring Creek Hatchery	0.00%	0.54%	0.07%	0.06%	NA
Puget Sound Natural	0.00%	0.53%	0.22%	0.13%	Green
Willamette River Hatchery	0.00%	0.50%	0.08%	0.05%	NA
Spring Cowlitz Hatchery	0.00%	0.37%	0.14%	0.10%	NA
Fall Cowlitz Hatchery	0.00%	0.37%	0.04%	0.02%	NA
Stillaguamish Summer/Fall	0.00%	0.34%	1.44%	0.71%	Stillaguamish
Snake River Fall	0.00%	0.31%	0.54%	0.40%	Not Represented
Nooksack Spring	0.00%	0.28%	0.32%	0.15%	Nooksack
Alaska South SE	0.00%	0.28%	0.02%	0.01%	King Salmon Andrew Creek Blossom Keta Unuk Chickamin

[1] NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D4. WCVI troll and outside sport.

FISHERY	WCVI TROLL AND OUTSIDE SPORT				
	2012	Average (1985–2011)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	Associated Escapement Indicator Stocks[1]
Fraser Late	9.53%	23.69%	23.38%	11.01%	Harrison
Puget Sound Hatchery Fingerling	13.18%	10.89%	15.04%	9.19%	NA
Columbia Upriver Bright	18.72%	8.37%	8.48%	4.56%	Columbia Upriver Bright
Spring Creek Hatchery	10.37%	6.99%	13.35%	10.51%	NA
Fall Cowlitz Hatchery	7.78%	6.94%	22.25%	10.20%	NA
Lower Bonneville Hatchery	6.61%	5.32%	30.40%	13.98%	NA
Oregon Coastal North Migrating	4.72%	4.73%	6.96%	3.38%	Oregon Coastal
Nooksack Fall	2.45%	4.40%	10.41%	7.97%	NA
WCVI Hatchery	0.00%	3.99%	6.30%	2.82%	NA
Mid-Columbia Brights	5.27%	3.51%	12.15%	5.45%	Not Represented
Columbia Upriver Summer	5.73%	3.00%	20.27%	9.39%	Columbia Upriver Summer
Washington Coastal Wild	1.49%	2.53%	8.92%	5.07%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall
Puget Sound Natural	1.25%	2.31%	17.21%	9.26%	Green
WA Coastal Hatchery	1.45%	2.20%	8.77%	4.88%	NA
Willamette River Hatchery	2.11%	2.08%	6.22%	3.03%	NA
Puget Sound Yearling	2.65%	1.56%	9.76%	6.96%	NA
Fraser Early	0.83%	1.54%	4.38%	1.14%	Upper Fraser Middle Fraser Thompson
WCVI Wild	0.00%	1.00%	6.29%	2.82%	WCVI
Skagit Summer/Fall	0.62%	0.92%	20.48%	6.83%	Skagit Summer/Fall
Lewis River Wild	0.73%	0.78%	10.07%	4.95%	Lewis River
Spring Cowlitz Hatchery	0.61%	0.67%	7.26%	4.60%	NA
Snake River Fall	2.76%	0.60%	21.65%	14.40%	Not Represented
North/Central B.C.	0.25%	0.51%	0.39%	0.19%	Yakoun Nass Skeena Area 6 Index Area 8 Index Rivers Inlet Smith Inlet
Lower Strait of Georgia Hatchery	0.16%	0.47%	2.72%	1.44%	NA
Snohomish Summer/Fall	0.28%	0.45%	14.70%	6.81%	Snohomish
Lower Strait of Georgia	0.17%	0.25%	2.67%	1.51%	Lower Strait of Georgia
Upper Strait of Georgia	0.10%	0.13%	0.55%	0.33%	Upper Strait of Georgia
Stillaguamish Summer/Fall	0.12%	0.11%	15.49%	6.52%	Stillaguamish
Nooksack Spring	0.06%	0.07%	10.83%	3.77%	Not Represented
Alaska South SE	0.00%	0.00%	0.00%	0.00%	King Salmon Andrew Creek Blossom Keta Unuk Chickamin

[1] NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

Appendix D5. Strait of Georgia sport and troll.

FISHERY	STRAIT OF GEORGIA SPORT AND TROLL				
	2012	Average (1985–2011)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	Associated Escapement Indicator Stocks[1]
Fraser Late	32.97%	46.19%	37.99%	18.77%	Harrison
Lower Strait of Georgia Hatchery	5.93%	9.90%	42.83%	25.07%	NA
Nooksack Fall	11.44%	9.18%	17.97%	13.53%	NA
Puget Sound Hatchery Fingerling	11.08%	6.54%	7.63%	4.59%	NA
Lower Strait of Georgia	5.70%	5.56%	43.59%	26.73%	Lower Strait of Georgia
Fraser Early	4.88%	4.42%	9.86%	2.61%	Upper Fraser Middle Fraser Thompson
Puget Sound Yearling	9.49%	4.13%	19.78%	13.92%	NA
Upper Strait of Georgia	5.24%	3.14%	10.75%	6.42%	Upper Strait of Georgia
Puget Sound Natural	0.93%	1.31%	8.21%	4.34%	Green
Skagit Summer/Fall	1.07%	1.22%	23.52%	7.78%	Skagit Summer/Fall
Columbia Upriver Bright	2.34%	1.17%	0.92%	0.48%	Columbia Upriver Bright
Washington Coastal Wild	0.89%	0.95%	2.68%	1.55%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall
Spring Creek Hatchery	1.41%	0.94%	1.44%	1.13%	NA
WA Coastal Hatchery	0.86%	0.81%	2.55%	1.51%	NA
WCVI Hatchery	0.87%	0.79%	1.29%	0.43%	NA
Lower Bonneville Hatchery	0.73%	0.65%	3.30%	1.36%	NA
North/Central B.C.	0.69%	0.64%	0.48%	0.22%	Yakoun Nass Skeena Area 6 Index Area 8 Index Rivers Inlet Smith Inlet
Snohomish Summer/Fall	0.49%	0.59%	15.42%	7.70%	Snohomish
Nooksack Spring	0.68%	0.47%	65.09%	24.45%	Not Represented
Columbia Upriver Summer	1.09%	0.45%	2.80%	1.19%	Columbia Upriver Summer
Mid-Columbia Brights	0.63%	0.39%	1.15%	0.51%	Not Represented
Stillaguamish Summer/Fall	0.27%	0.18%	21.54%	9.08%	Stillaguamish
WCVI Wild	0.11%	0.16%	1.30%	0.43%	WCVI
Willamette River Hatchery	0.17%	0.14%	0.33%	0.17%	NA
Spring Cowlitz Hatchery	0.04%	0.05%	0.44%	0.26%	NA
Fall Cowlitz Hatchery	0.00%	0.02%	0.03%	0.02%	NA
Lewis River Wild	0.00%	0.02%	0.15%	0.08%	Lewis River
Snake River Fall	0.02%	0.00%	0.11%	0.07%	Not Represented
Oregon Coastal North Migrating	0.00%	0.00%	0.00%	0.00%	Oregon Coastal
Alaska South SE	0.00%	0.00%	0.00%	0.00%	King Salmon Andrew Creek Blossom Keta Unuk Chickamin

[1] NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

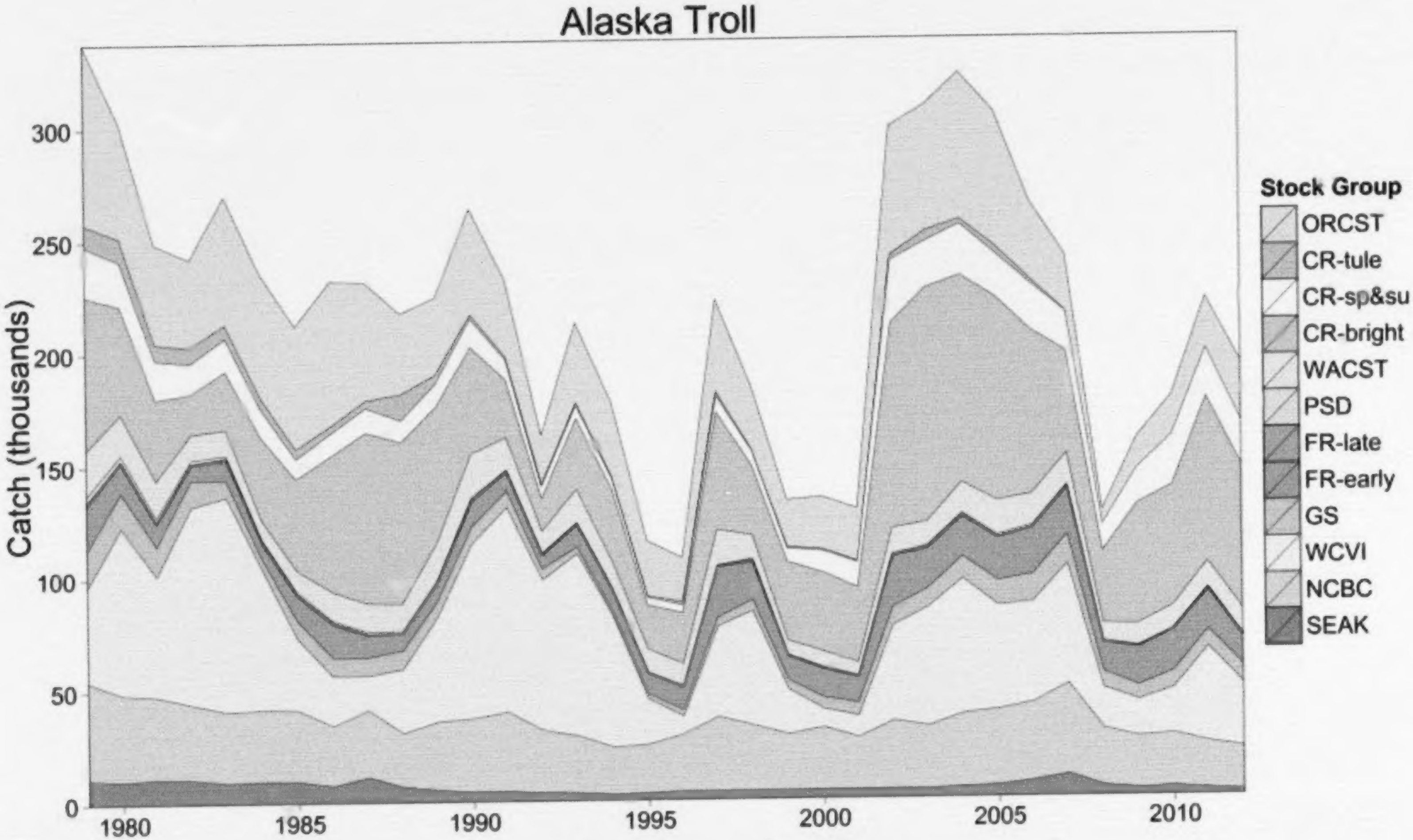
Appendix D6. Washington/Oregon troll and sport.

FISHERY	WA/OR TROLL AND SPORT				
	2012	Average (1985–2011)			
Model Stock	% of Fishery Catch	% of Fishery Catch	% of Stock Catch	% of Stock Tot. Ret.	Associated Escapement Indicator Stocks[1]
Spring Creek Hatchery	29.64%	23.84%	29.57%	23.39%	NA
Fall Cowlitz Hatchery	20.57%	19.49%	41.18%	18.06%	NA
Fraser Late	8.60%	18.94%	12.00%	5.54%	Harrison
Lower Bonneville Hatchery	11.95%	10.23%	40.37%	17.22%	NA
Spring Cowlitz Hatchery	3.57%	4.47%	34.18%	19.57%	NA
Puget Sound Hatchery Fingerling	3.99%	4.27%	3.70%	2.17%	NA
Columbia Upriver Bright	6.31%	4.16%	2.72%	1.39%	Columbia Upriver Bright
Oregon Coastal North Migrating	2.05%	2.63%	2.59%	1.16%	Oregon Coastal
Willamette River Hatchery	1.66%	1.92%	3.77%	1.75%	NA
Nooksack Fall	1.06%	1.70%	2.44%	1.82%	NA
Mid-Columbia Brights	1.78%	1.44%	3.22%	1.37%	Not Represented
Lewis River Wild	1.34%	1.42%	13.32%	5.77%	Lewis River
Washington Coastal Wild	0.70%	1.17%	2.36%	1.32%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall
WA Coastal Hatchery	0.68%	1.01%	2.31%	1.28%	NA
Snake River Fall	3.83%	1.00%	21.86%	13.98%	Not Represented
Puget Sound Natural	0.39%	0.92%	4.33%	2.17%	Green
Columbia Upriver Summer	1.24%	0.77%	3.13%	1.42%	Columbia Upriver Summer
Puget Sound Yearling	0.38%	0.27%	1.06%	0.72%	NA
Fraser Early	0.17%	0.20%	0.44%	0.11%	Upper Fraser Middle Fraser Thompson
Alaska South SE	0.03%	0.08%	0.75%	0.26%	King Salmon Andrew Creek Blossom Keta Unuk Chickamin
Lower Strait of Georgia Hatchery	0.02%	0.03%	0.14%	0.07%	NA
WCVI Hatchery	0.00%	0.03%	0.04%	0.01%	NA
Lower Strait of Georgia	0.02%	0.02%	0.15%	0.08%	Lower Strait of Georgia
WCVI Wild	0.00%	0.01%	0.04%	0.01%	WCVI
Skagit Summer/Fall	0.00%	0.00%	0.05%	0.02%	Skagit Summer/Fall
Snohomish Summer/Fall	0.00%	0.00%	0.05%	0.02%	Snohomish
Upper Strait of Georgia	0.00%	0.00%	0.00%	0.00%	Upper Strait of Georgia
Stillaguamish Summer/Fall	0.00%	0.00%	0.00%	0.00%	Stillaguamish
North/Central B.C.	0.00%	0.00%	0.00%	0.00%	Yakoun Nass Skeena Area 6 Index Area 8 Index Rivers Inlet Smith Inlet
Nooksack Spring	0.00%	0.00%	0.00%	0.00%	Not Represented

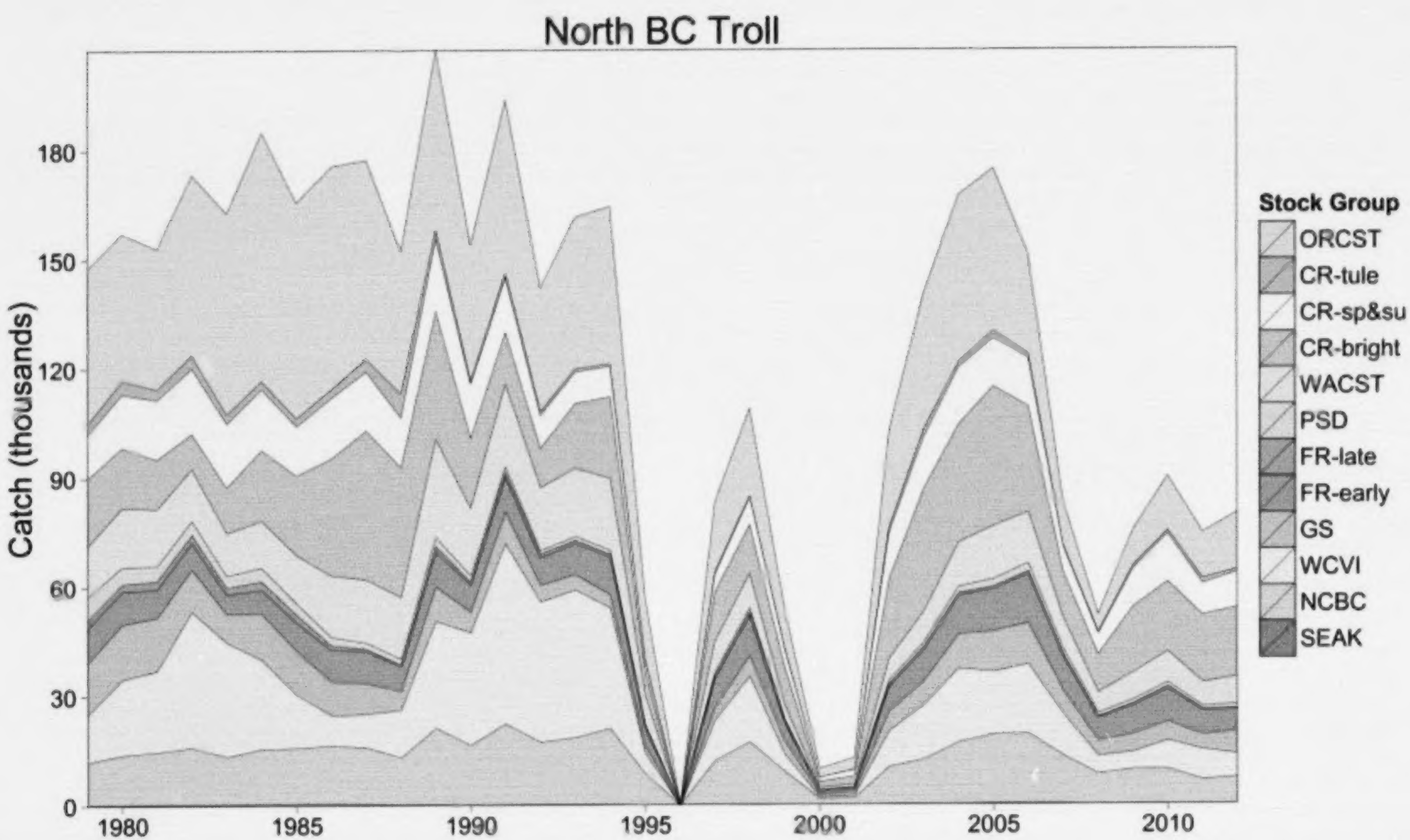
[1] NA = a hatchery stock; Not represented = a wild stock without an escapement indicator.

APPENDIX E: FIGURES OF CHINOOK MODEL-GENERATED STOCK COMPOSITION OF ACTUAL LANDED CATCH FOR ALL (AABM AND ISBM) MODEL FISHERIES, 1979-2012.

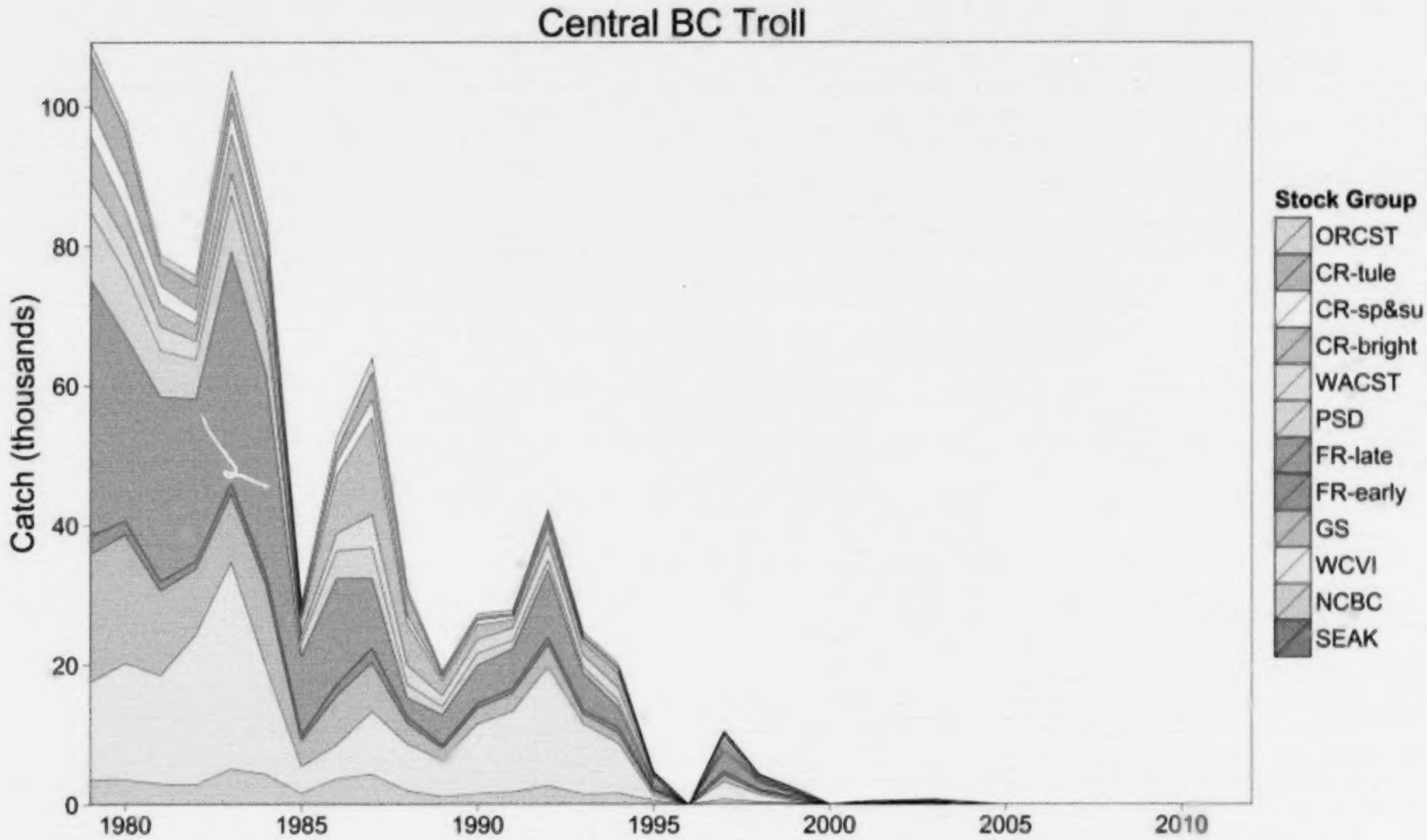
Stock abbreviations in each figure correspond to the following model stocks and aggregations:
ORCST = Oregon Coast
CR-tule = Columbia River-Fall Tule stocks (Spring Creek, Lower River Hatchery, and Cowlitz Fall)
CR-sp&su = Columbia River Spring and Summer stocks (Willamette, Cowlitz Spring, Columbia Summers)
CR-bright = Columbia River Fall Bright stocks (Upriver, Mid-Columbia, Lewis River Wild, Lyons Ferry)
WACST = Washington Coast
PSD = Puget Sound stocks (Nooksack Fall and Spring, Natural Fall Fingerlings, Hatchery Fall Fingerlings, Hatchery Yearlings, Skagit Wild, Stillaguamish Wild, Snohomish Wild)
FR-late = Fraser River Late stocks
FR-early = Fraser River Early stocks
GS = Strait of Georgia stocks (Upper, Lower Natural, Lower Hatchery)
WCVI = West Coast Vancouver Island Stocks (hatchery and natural)
NCBC = North Central British Columbia stocks
SEAK = Southeast Alaska stocks



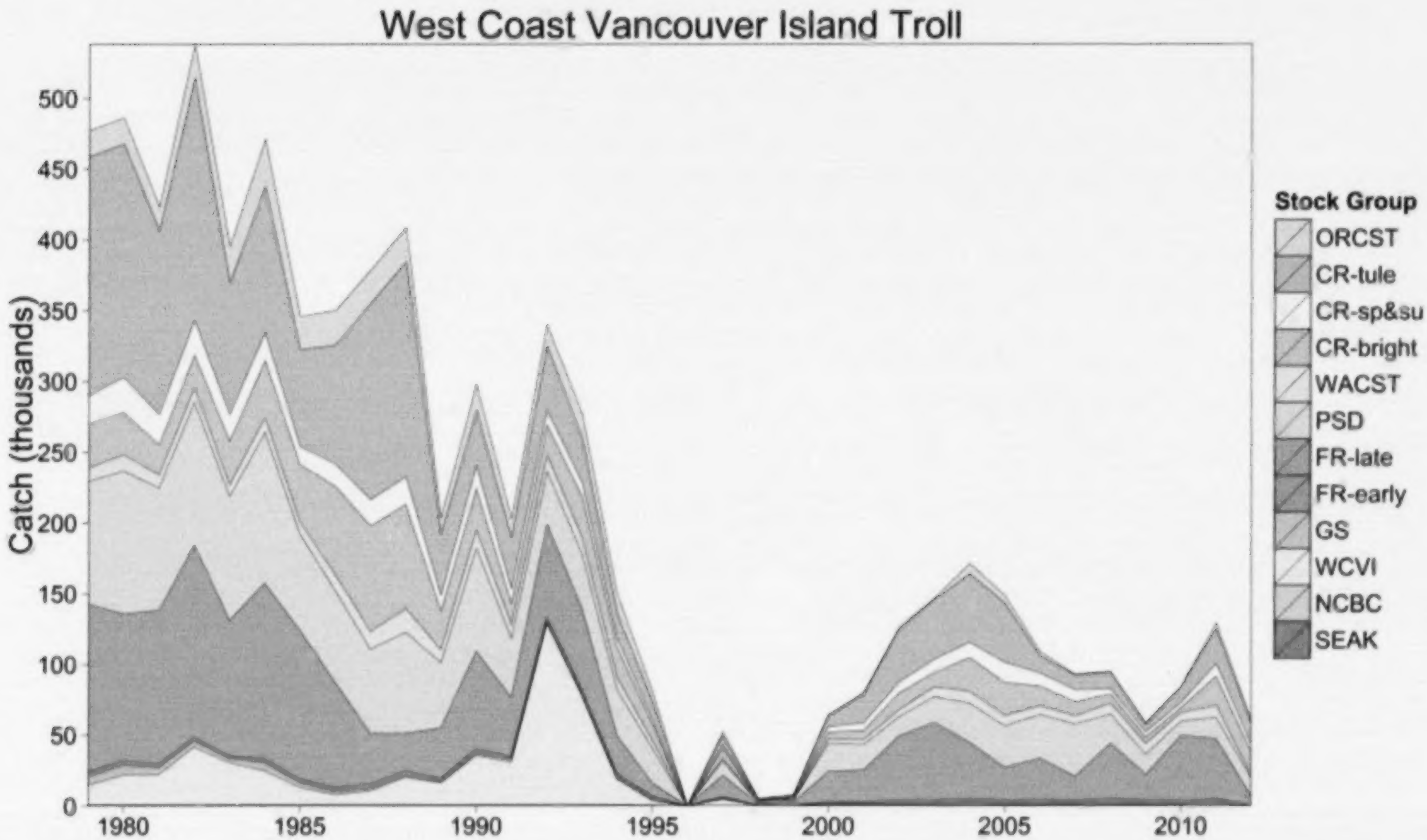
Appendix E1 Chinook Model estimates of landed catch stock composition for Alaska Troll 1979-2012



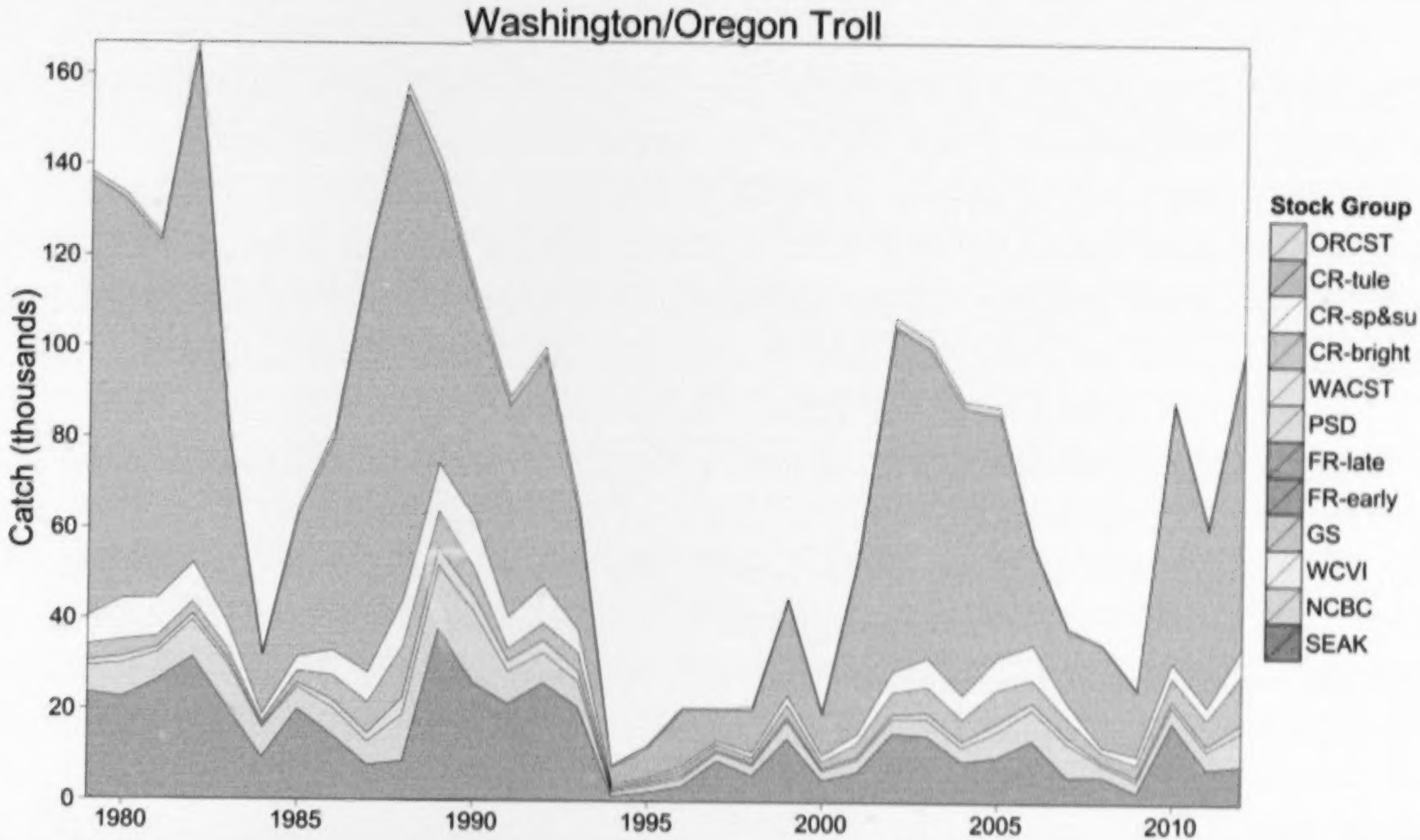
Appendix E2 Chinook Model estimates of landed catch stock composition for North BC Troll 1979-2012



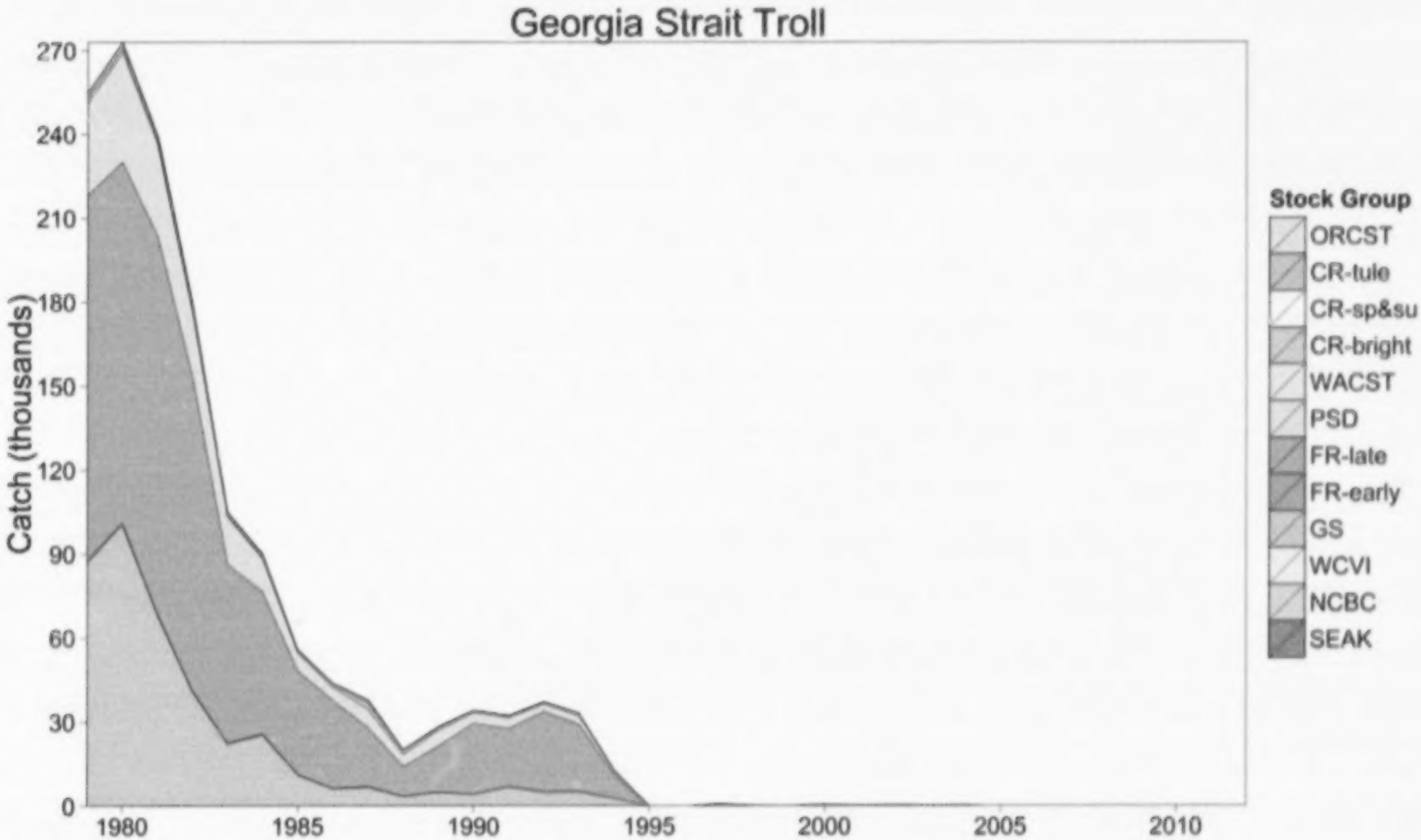
Appendix E3 Chinook Model estimates of landed catch stock composition for Central BC Troll 1979-2012



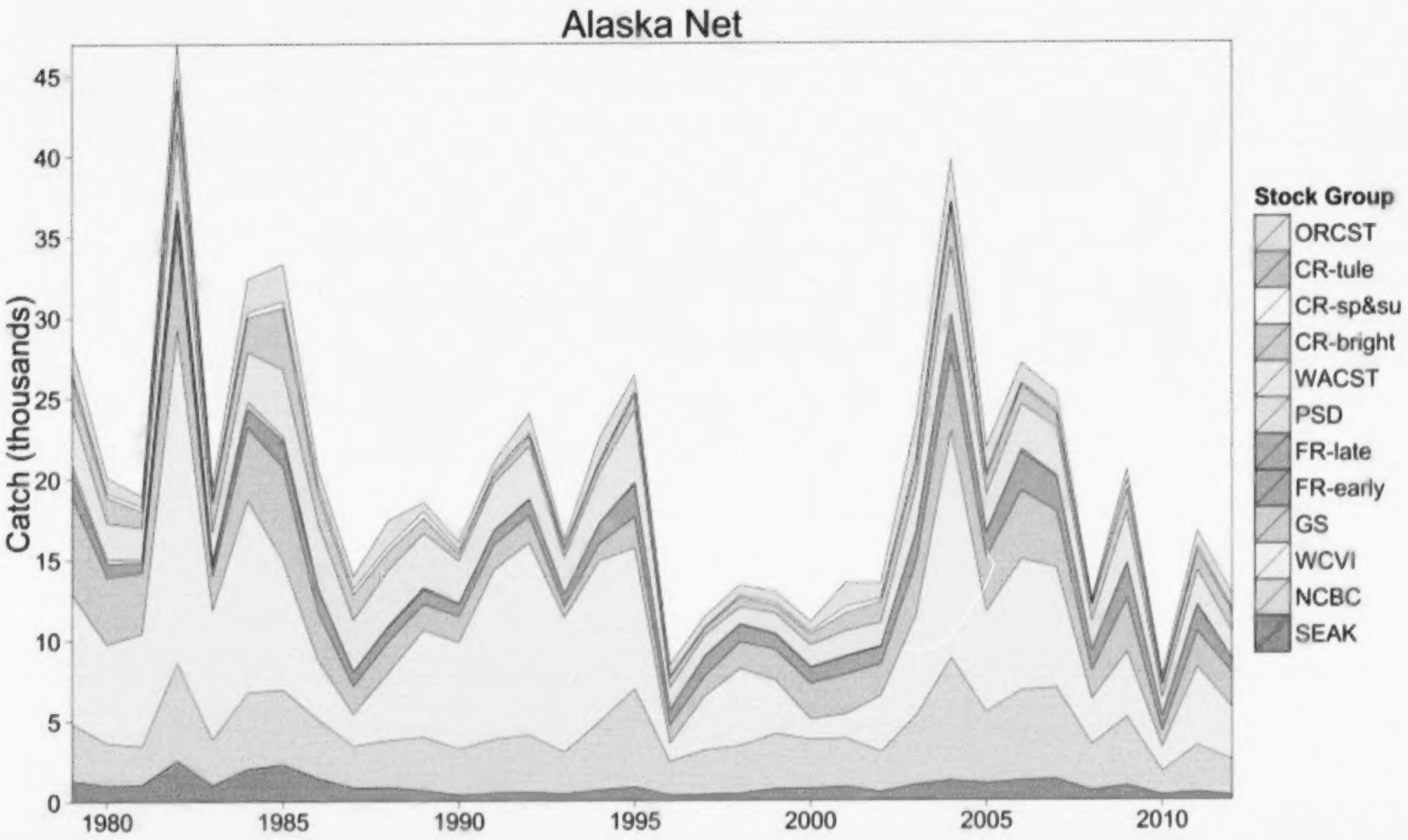
Appendix E4 Chinook Model estimates of landed catch stock composition for West Coast Vancouver Island Troll 1979-2012



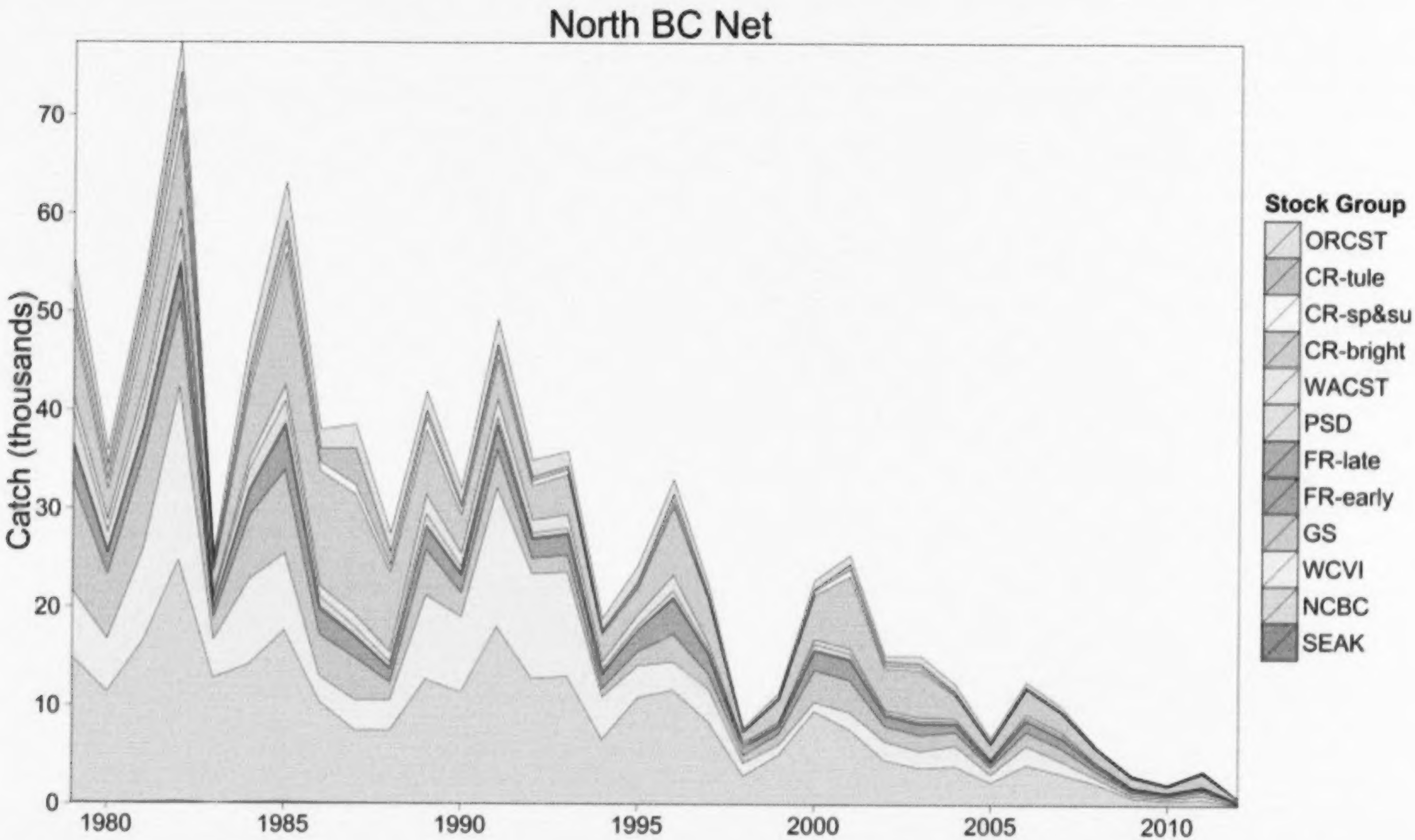
Appendix E5 Chinook Model estimates of landed catch stock composition for Washington/Oregon Troll 1979-2012



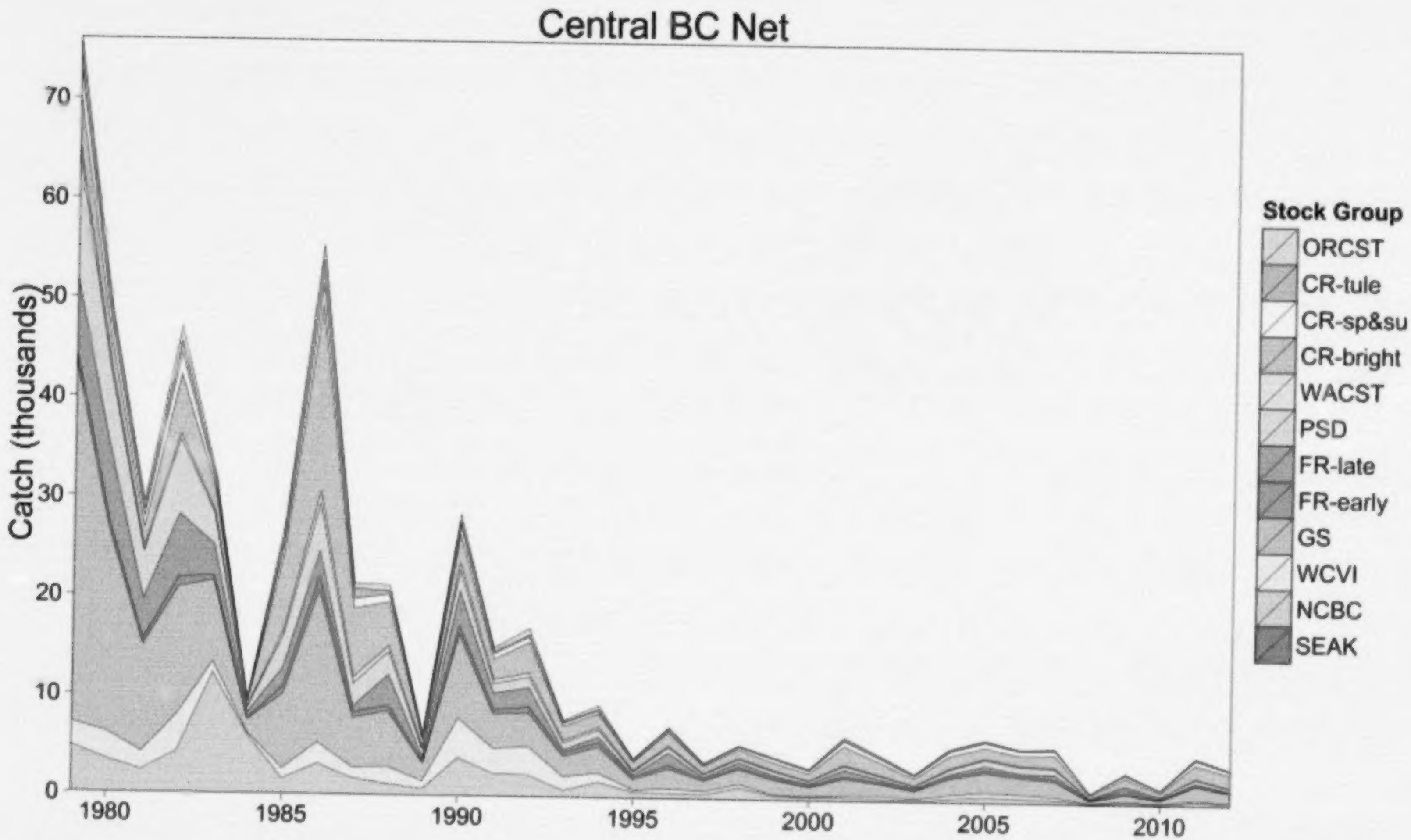
Appendix E6 Chinook Model estimates of landed catch stock composition for Georgia Strait Troll 1979-2012



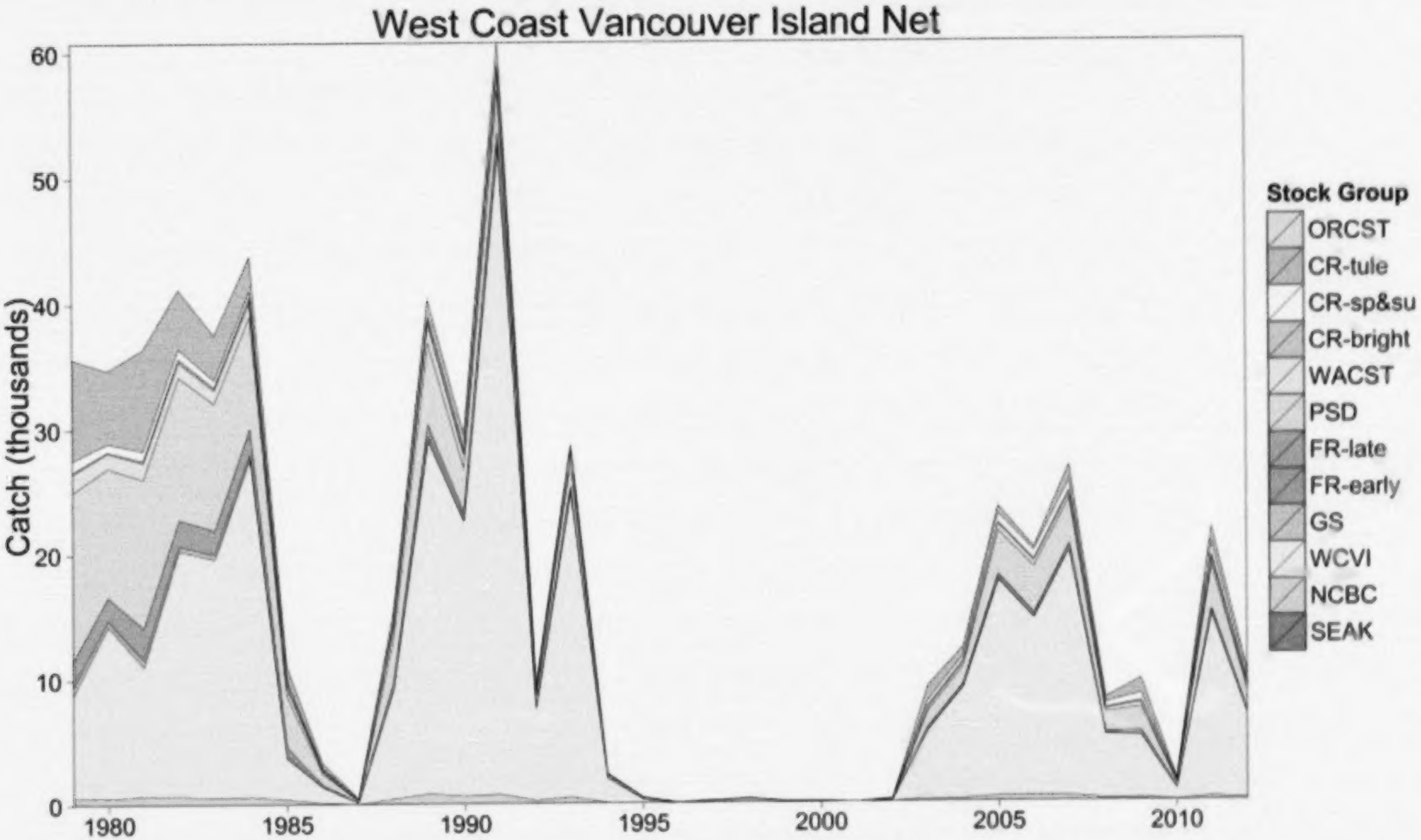
Appendix E7 Chinook Model estimates of landed catch stock composition for Alaska Net 1979-2012



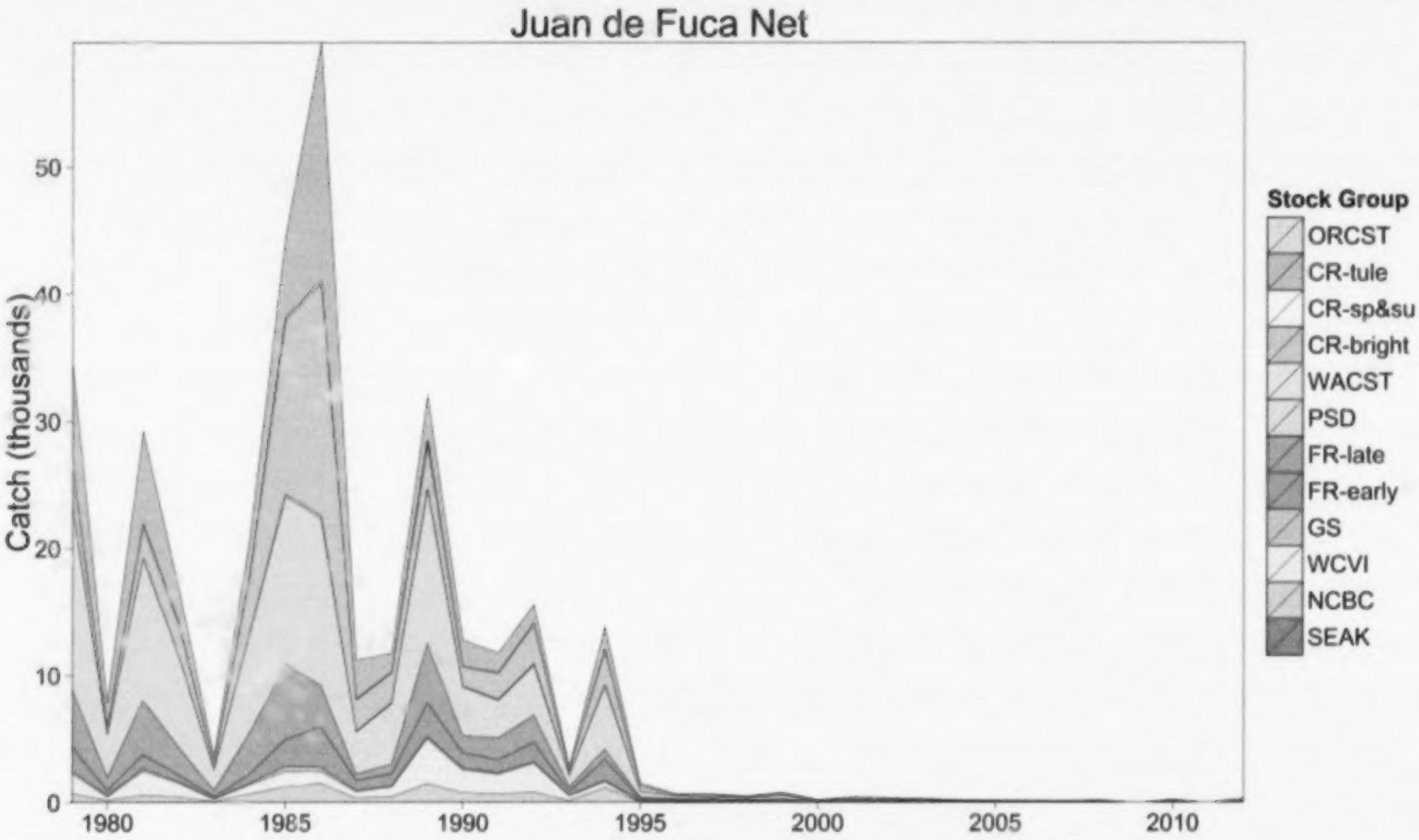
Appendix E8 Chinook Model estimates of landed catch stock composition for North BC Net 1979-2012



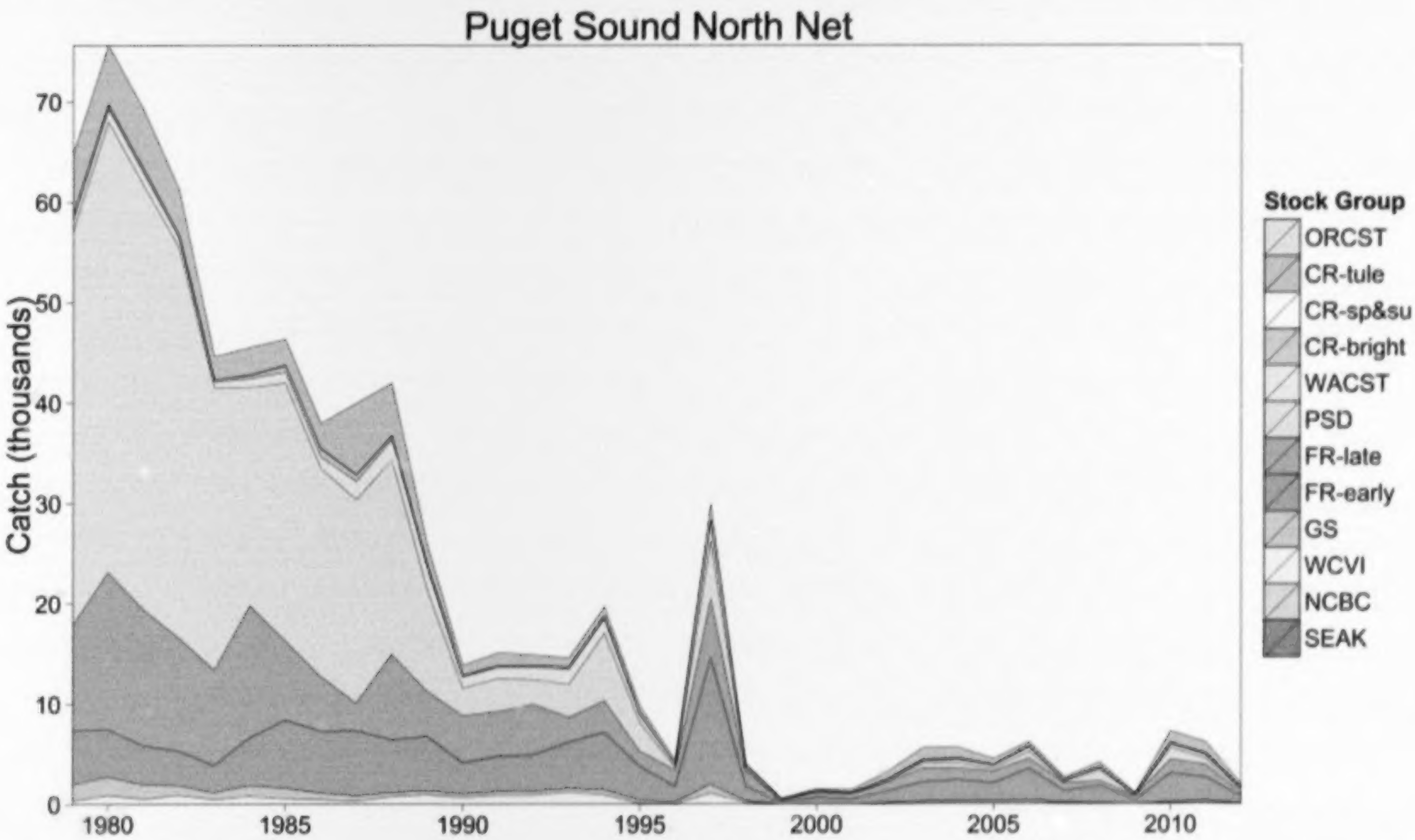
Appendix E9 Chinook Model estimates of landed catch stock composition for Central BC Net 1979-2012



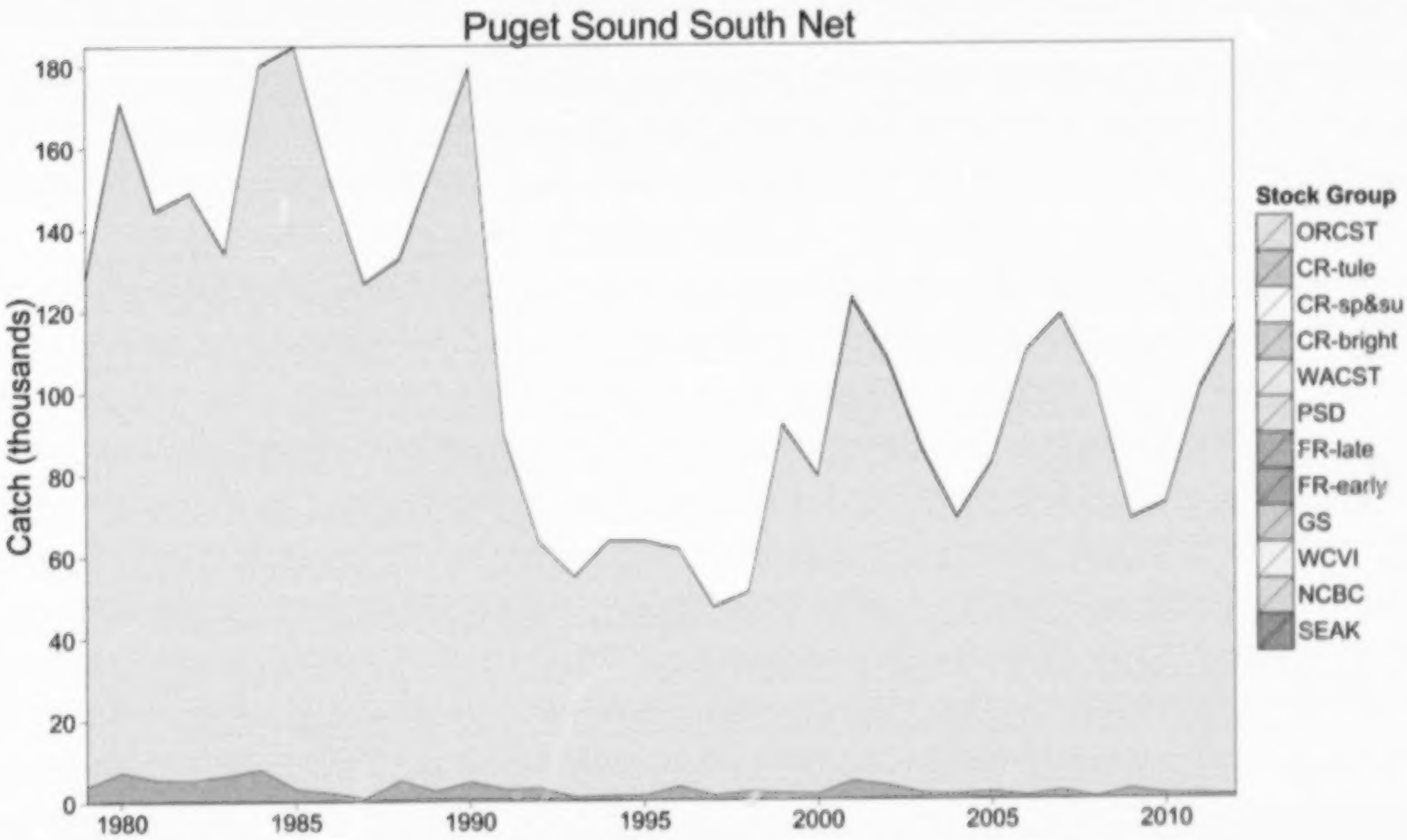
Appendix E10 Chinook Model estimates of landed catch stock composition for West Coast Vancouver Island Net 1979-2012



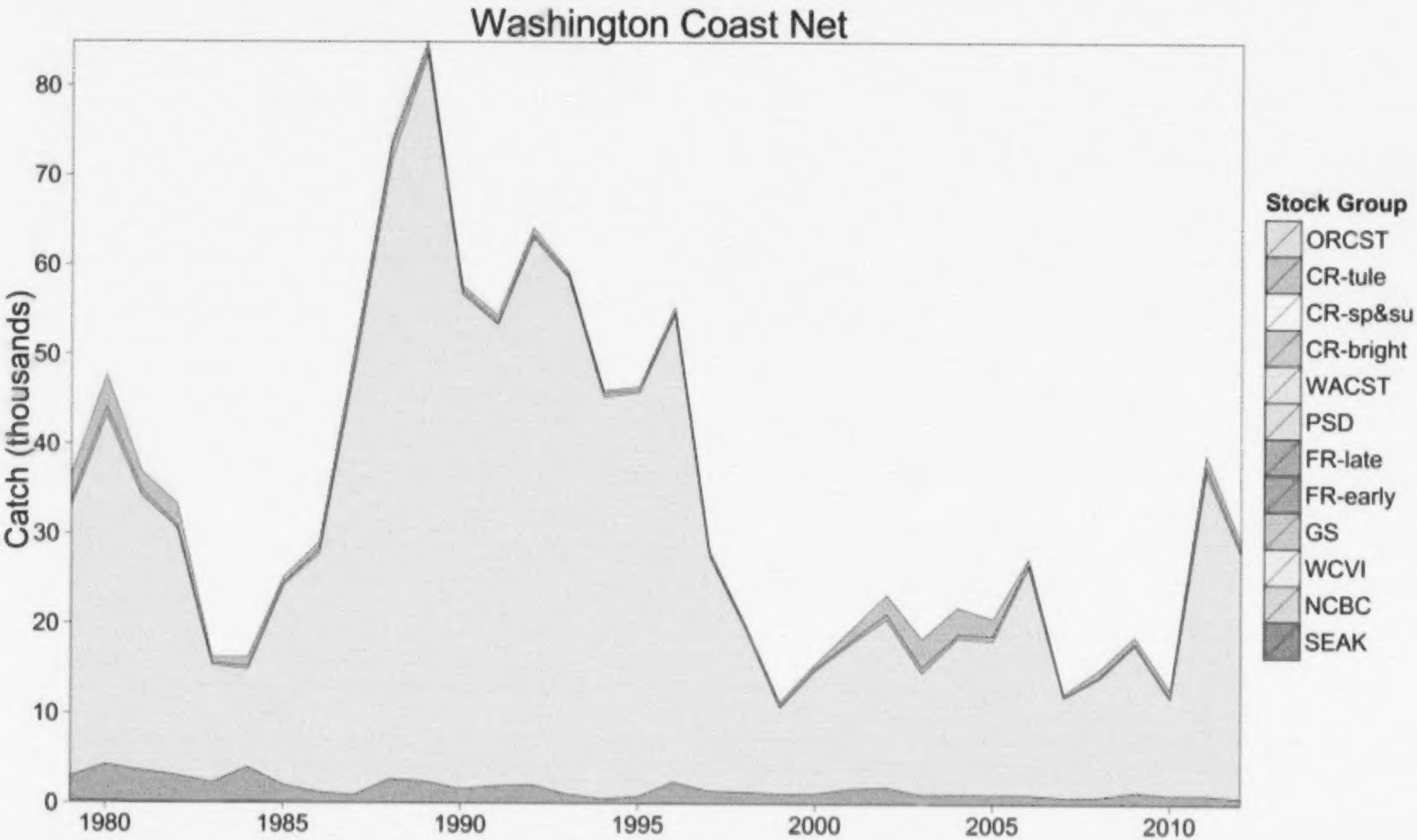
Appendix E11 Chinook Model estimates of landed catch stock composition for Juan de Fuca Net 1979-2012



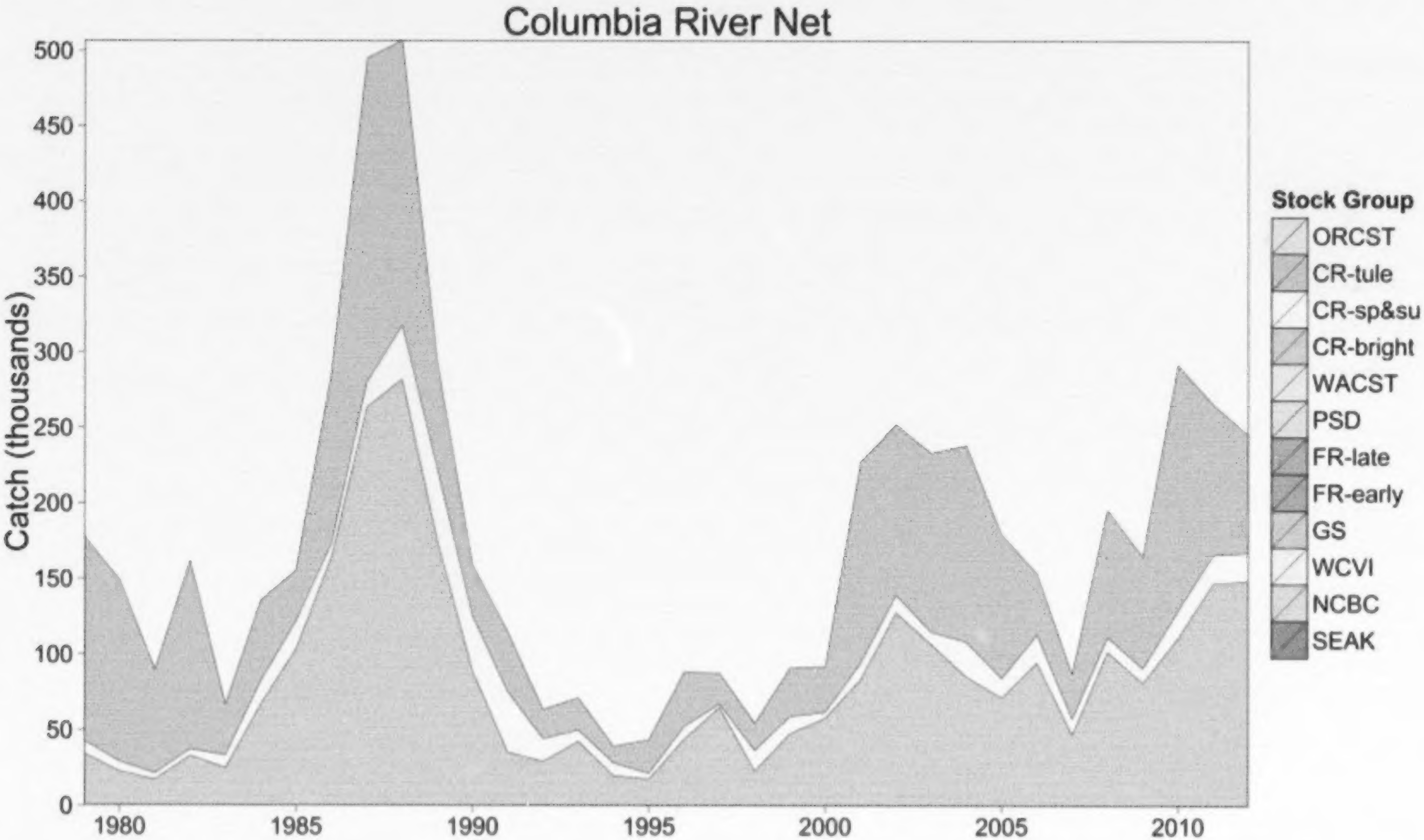
Appendix E12 Chinook Model estimates of landed catch stock composition for Puget Sound North Net 1979-2012



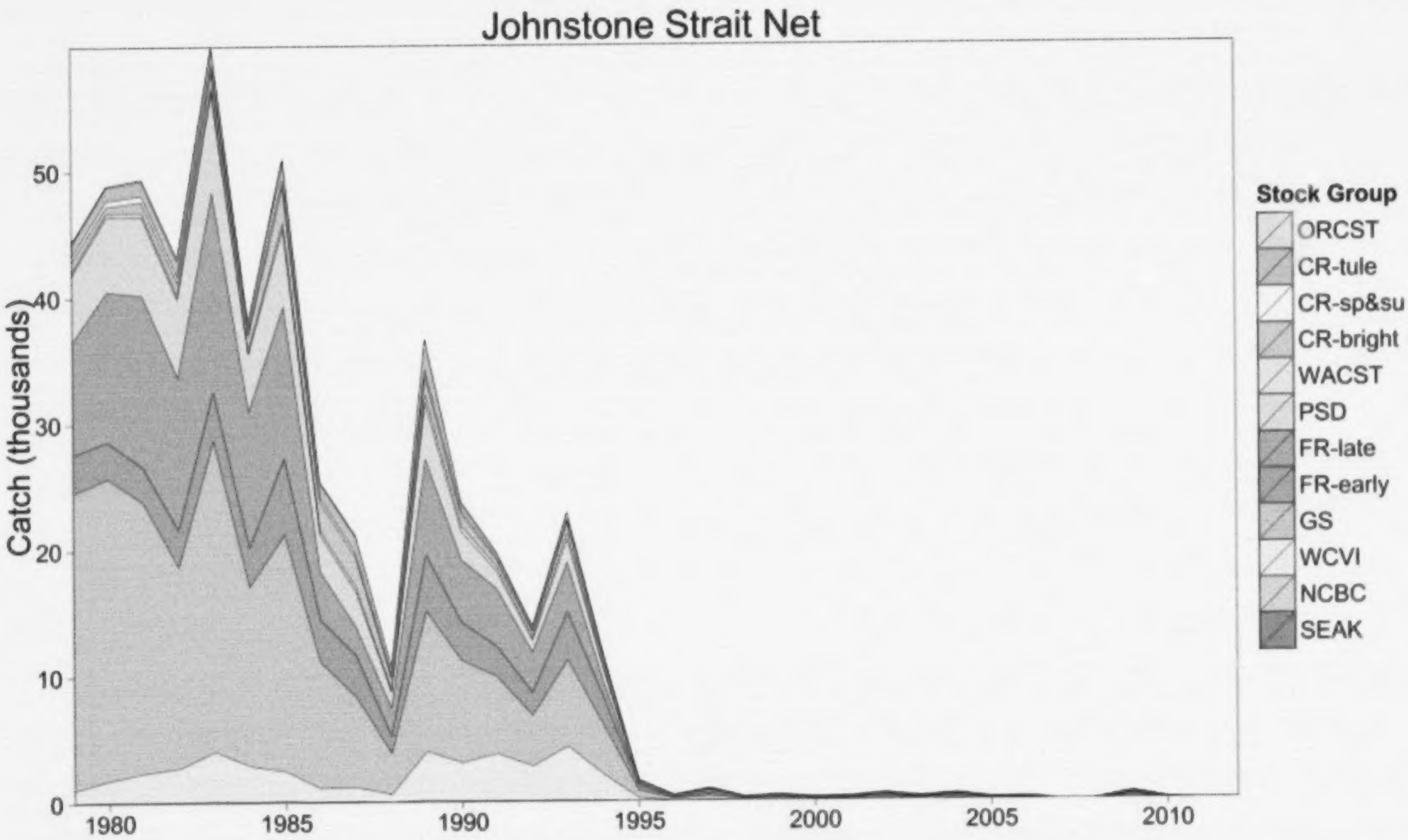
Appendix E13 Chinook Model estimates of landed catch stock composition for Puget Sound South Net 1979-2012



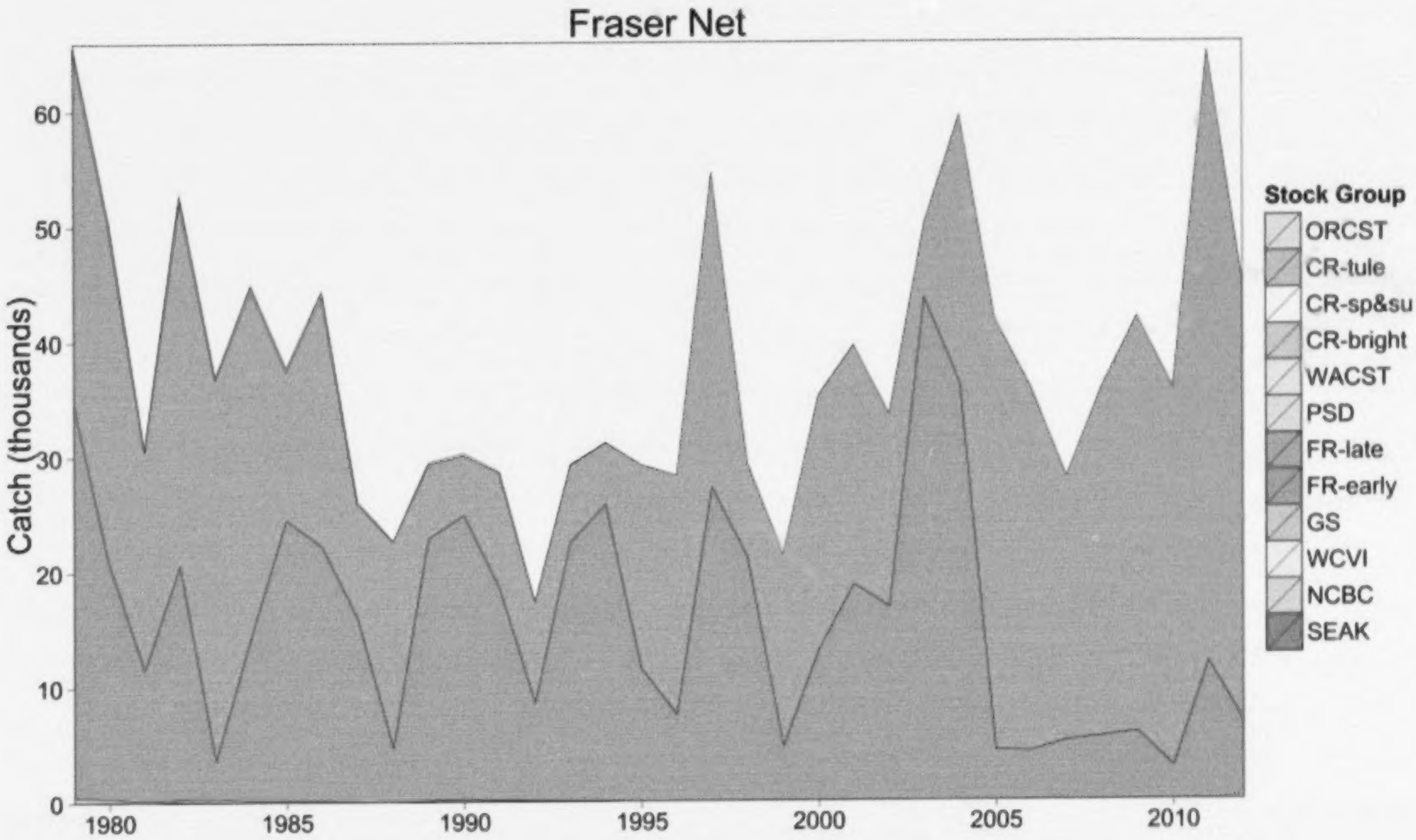
Appendix E14 Chinook Model estimates of landed catch stock composition for Washington Coast Net 1979-2012



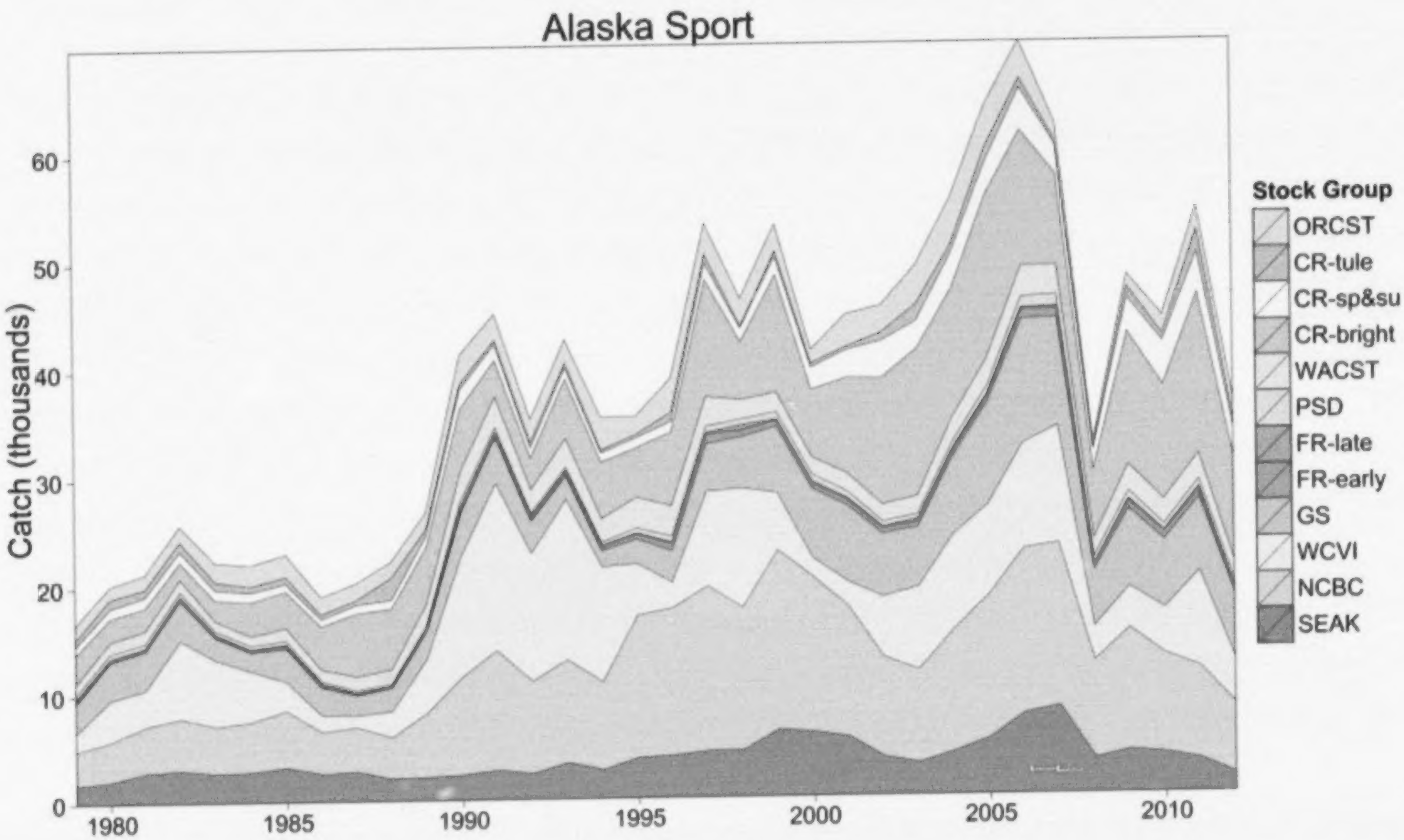
Appendix E15 Chinook Model estimates of landed catch stock composition for Columbia River Net 1979-2012



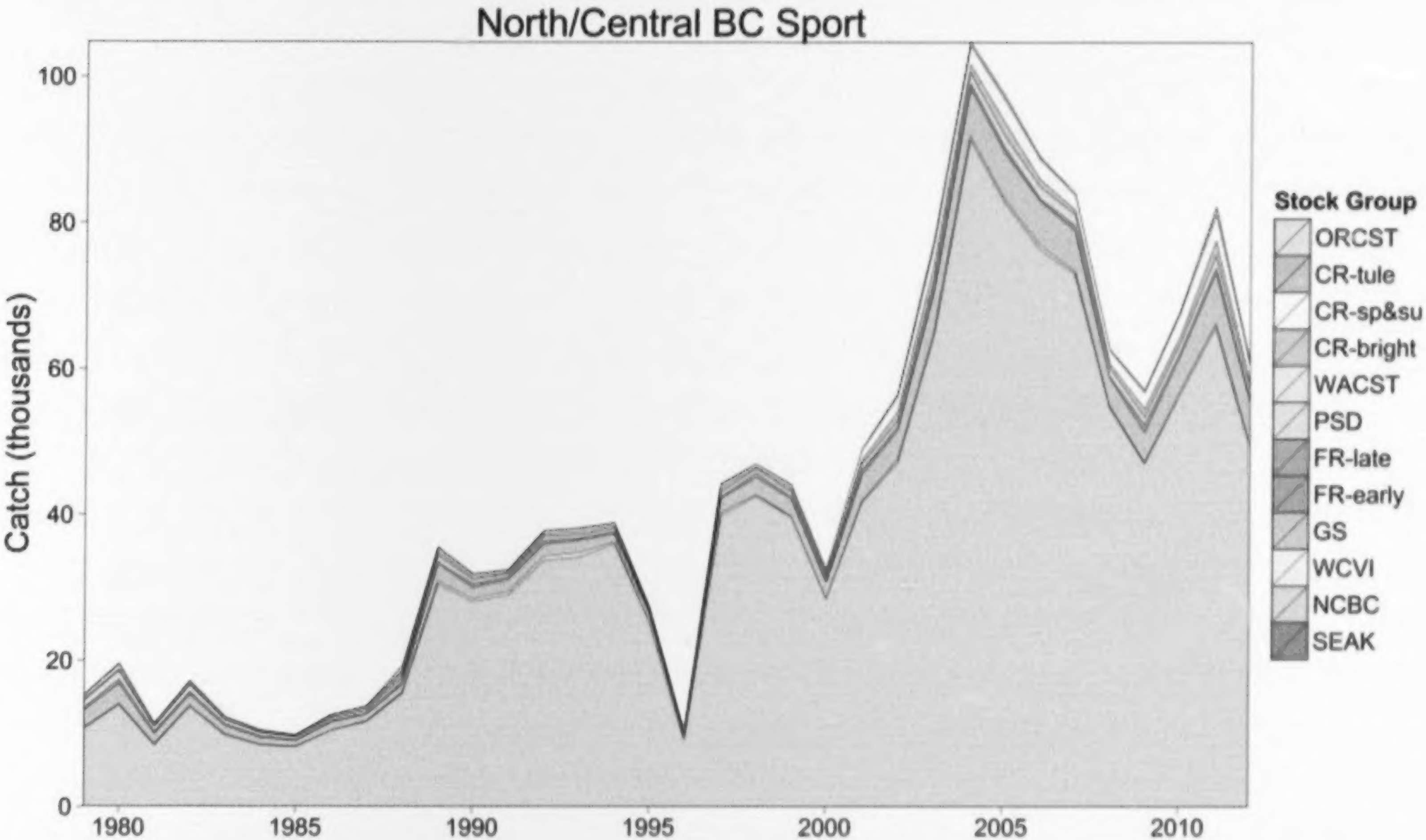
Appendix E16 Chinook Model estimates of landed catch stock composition for Johnstone Strait Net 1979-2012



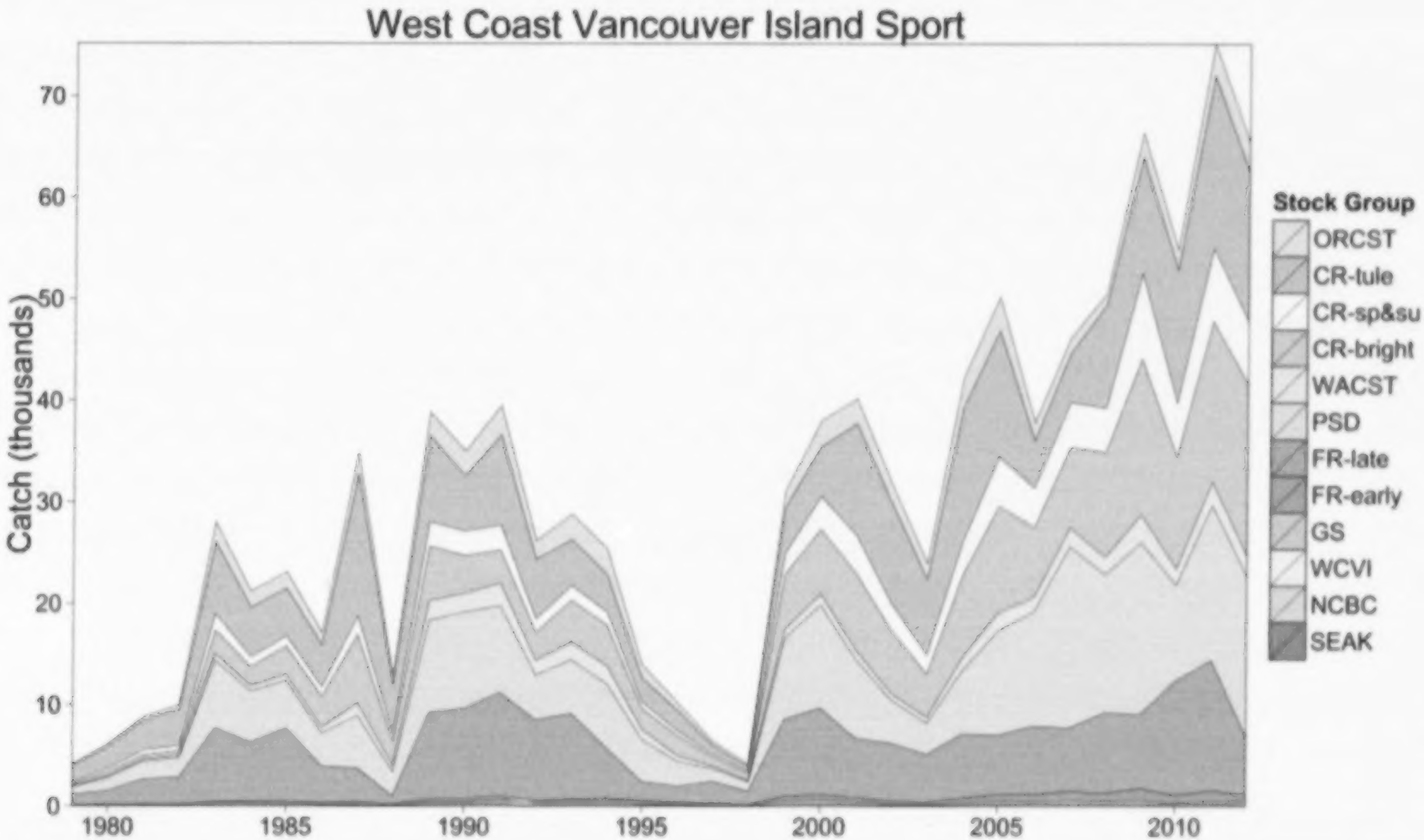
Appendix E17 Chinook Model estimates of landed catch stock composition for Fraser Net 1979-2012



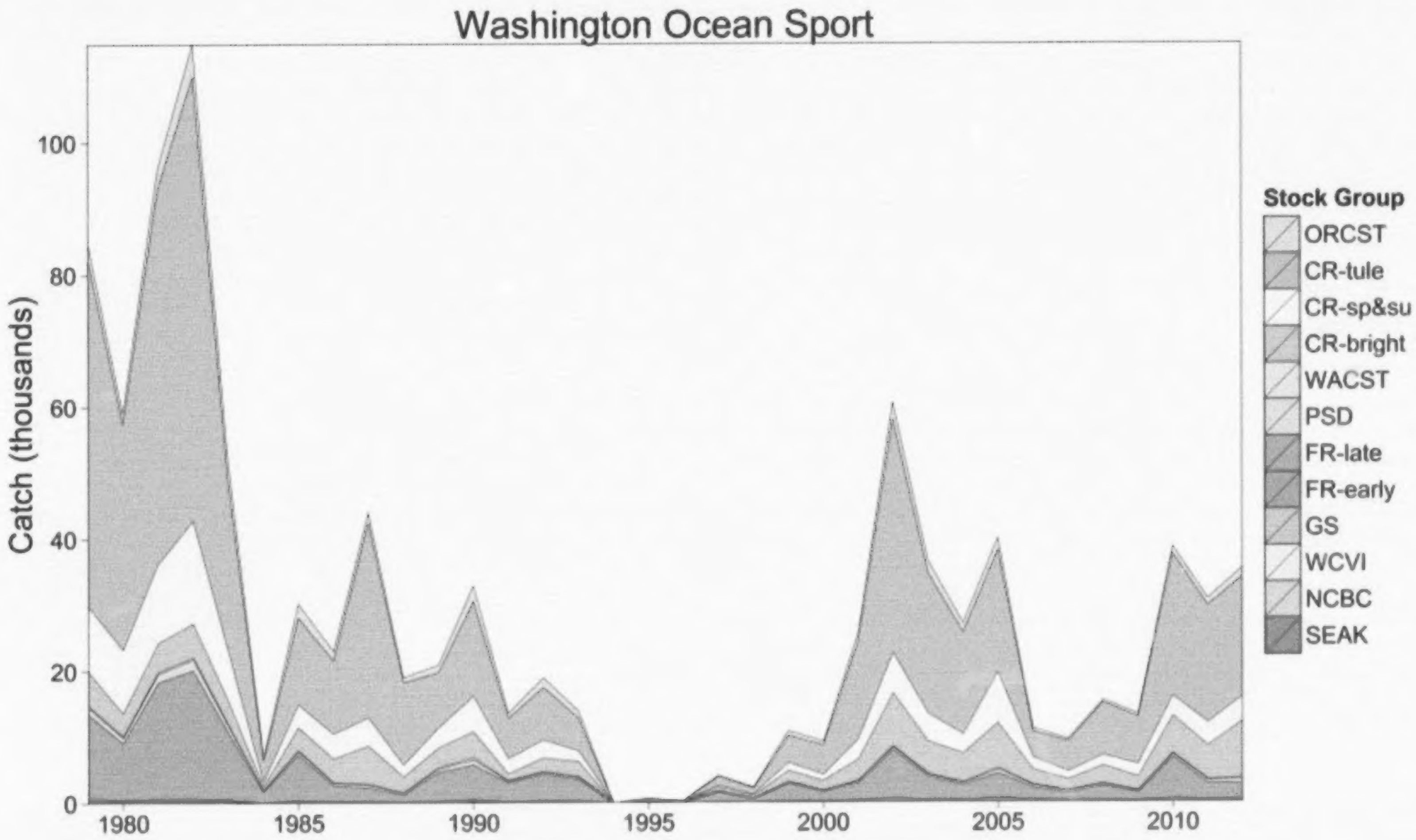
Appendix E18 Chinook Model estimates of landed catch stock composition for Alaska Sport 1979-2012



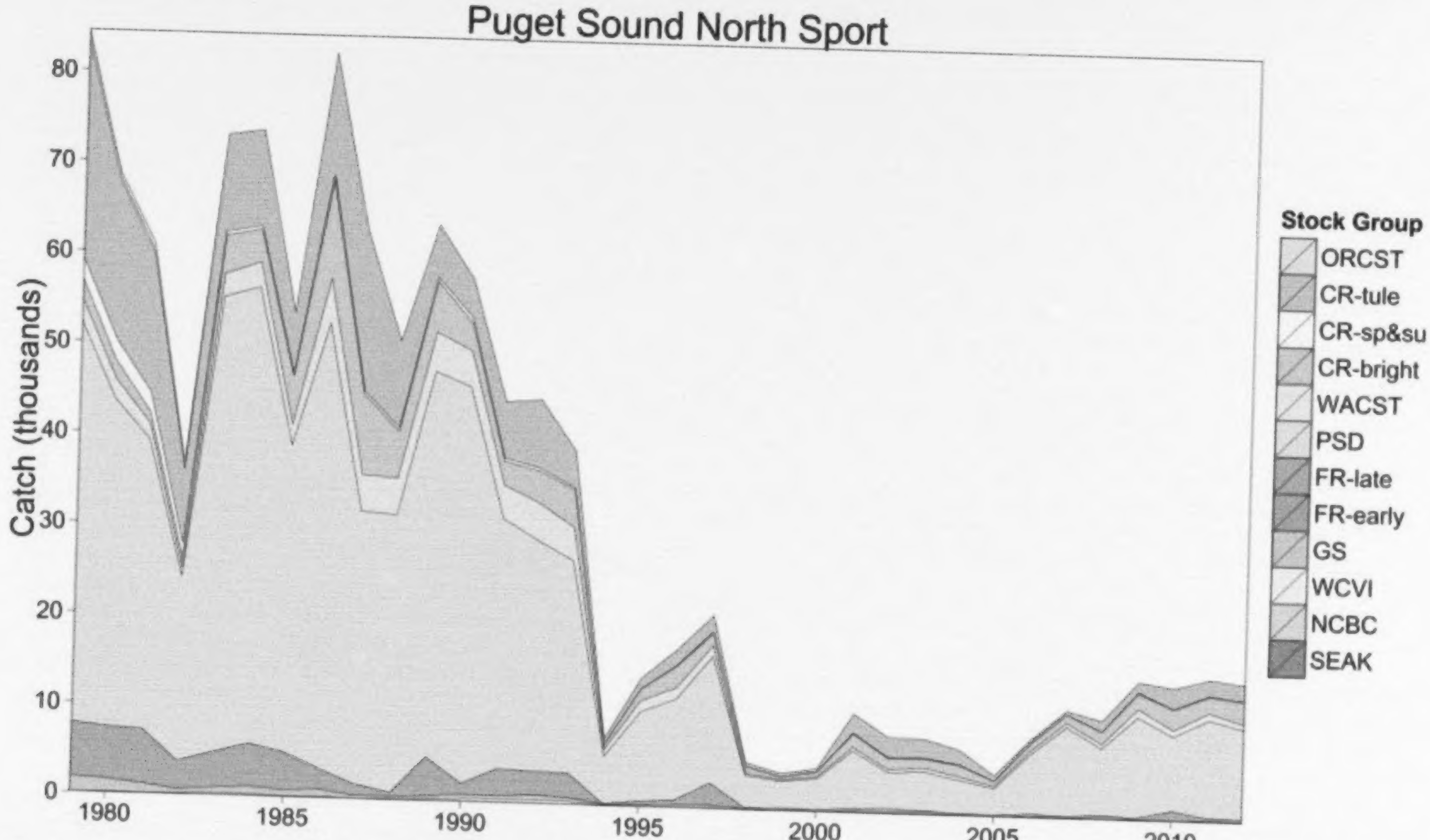
Appendix E19 Chinook Model estimates of landed catch stock composition for North/Central BC Sport 1979-2012



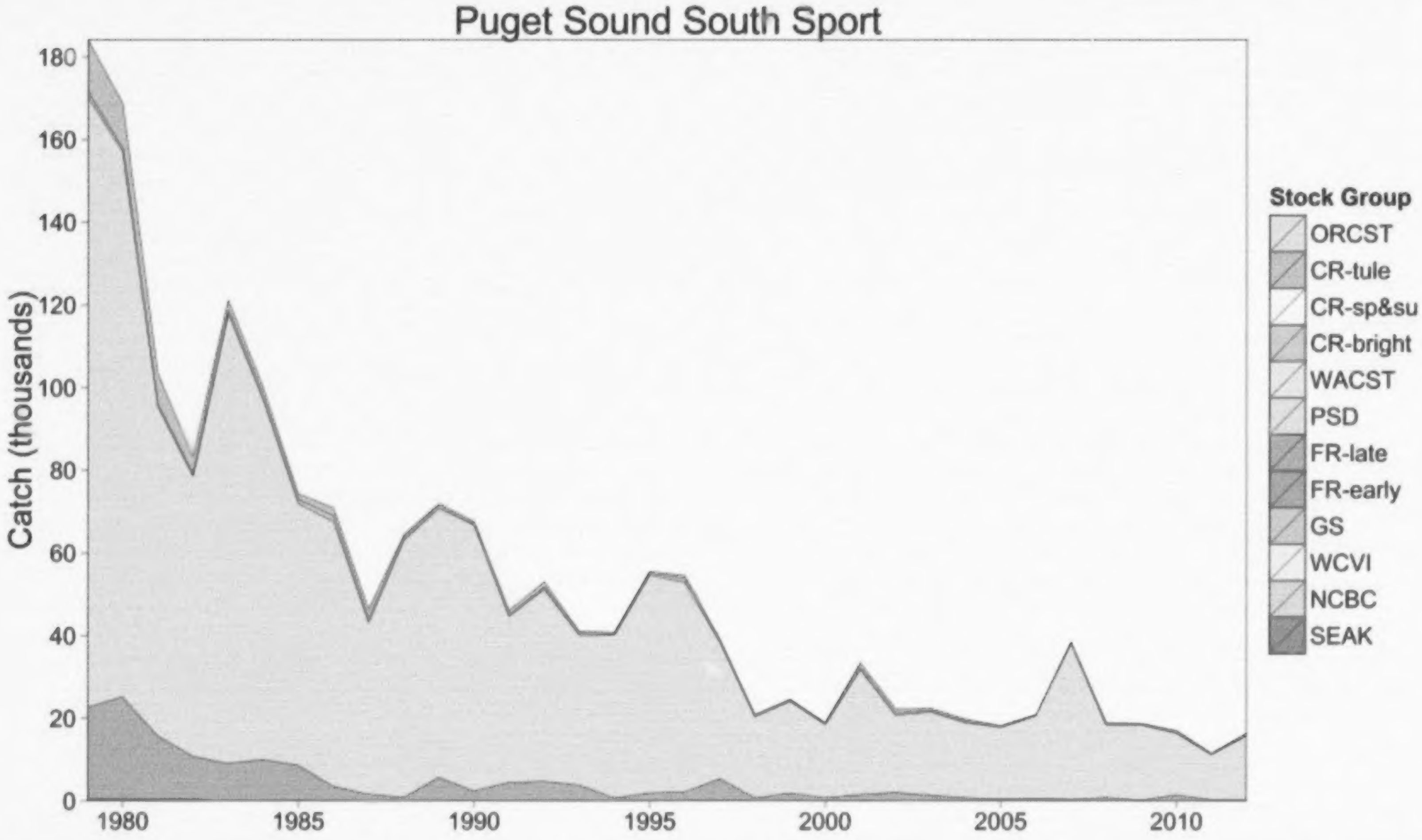
Appendix E20 Chinook Model estimates of landed catch stock composition for West Coast Vancouver Island Sport 1979-2012



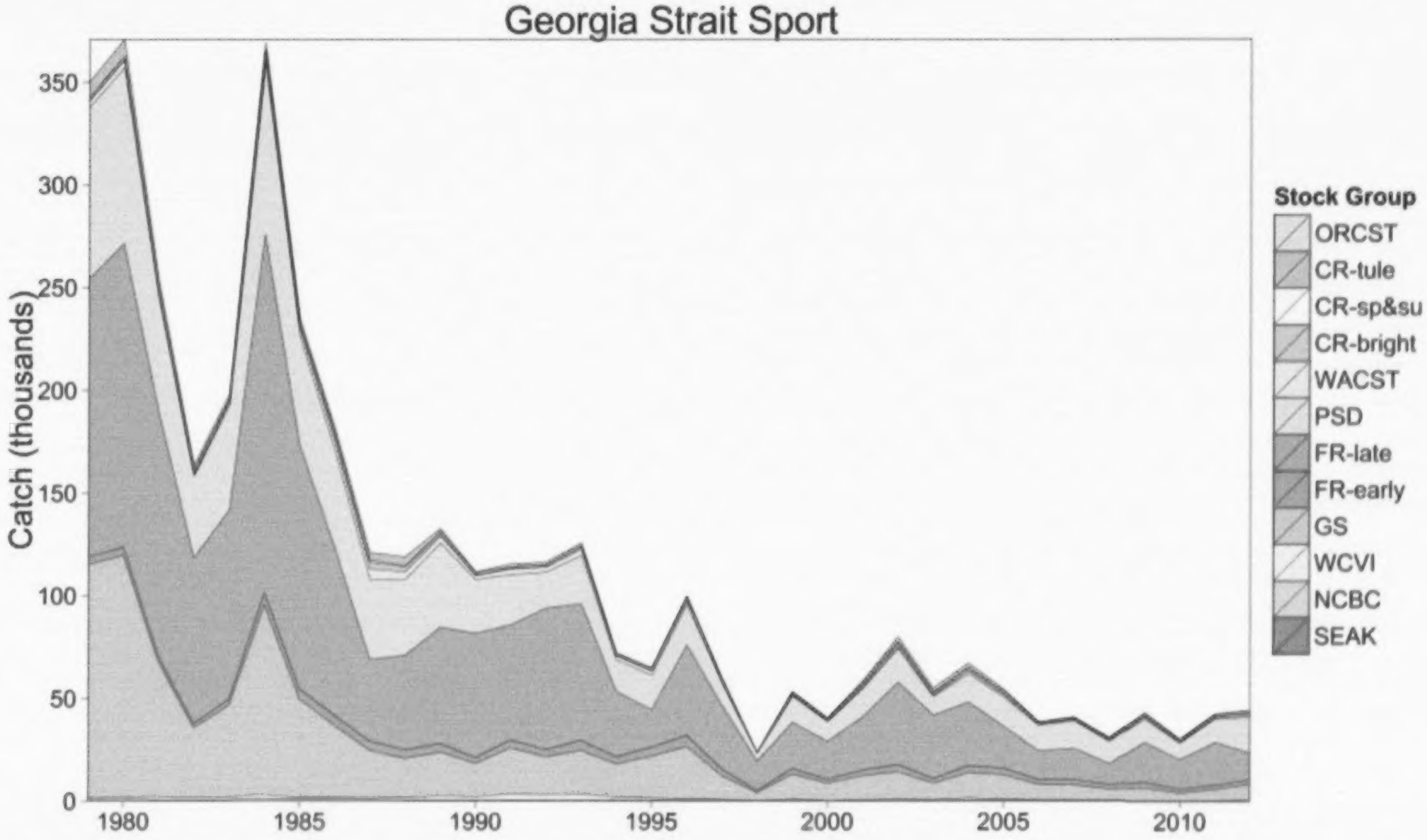
Appendix E21 Chinook Model estimates of landed catch stock composition for Washington Ocean Sport 1979-2012



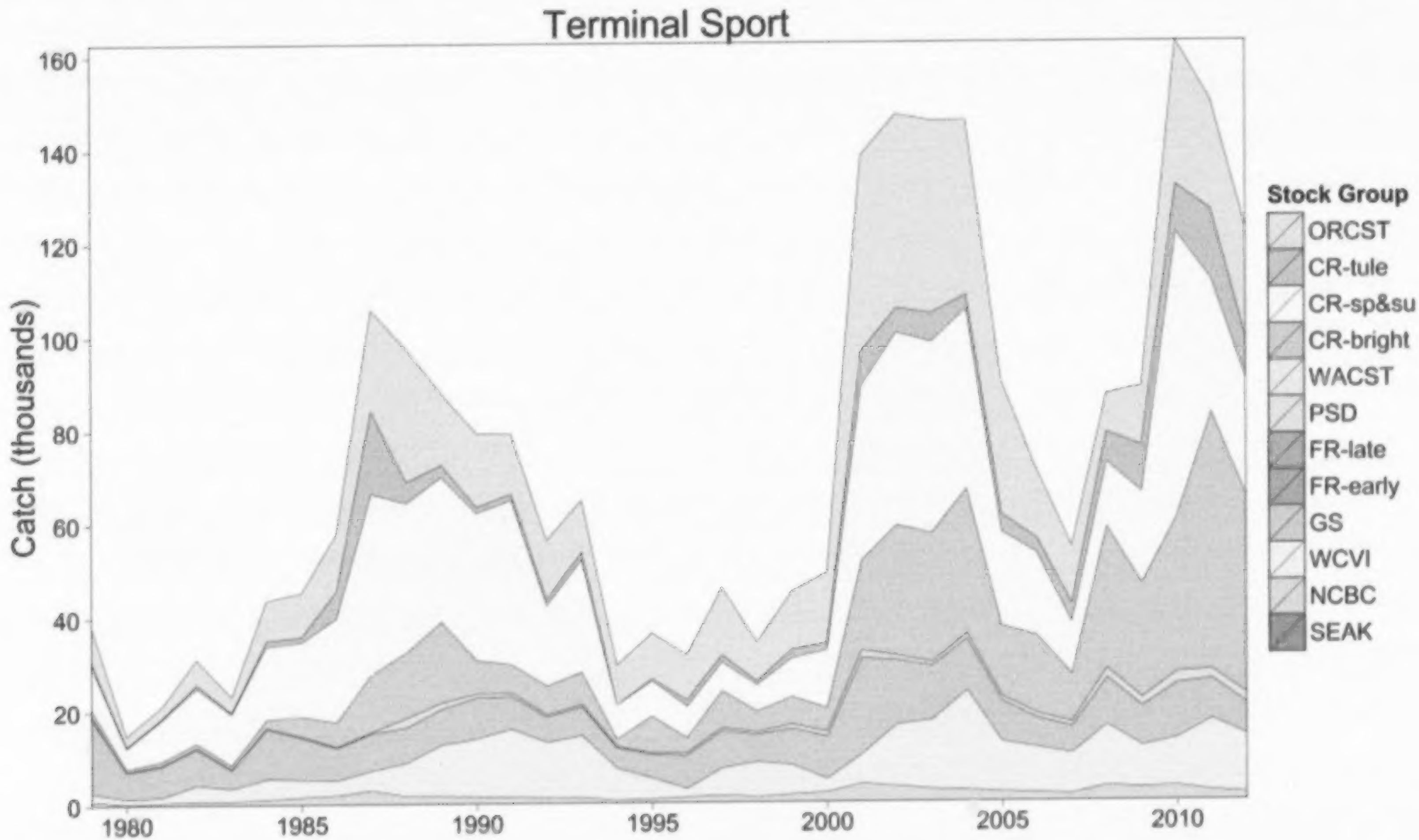
Appendix E22 Chinook Model estimates of landed catch stock composition for Puget Sound North Sport 1979-2012



Appendix E23 Chinook Model estimates of landed catch stock composition for Puget Sound South Sport 1979-2012



Appendix E24 Chinook Model estimates of landed catch stock composition for Georgia Strait Sport 1979-2012



Appendix E25 Chinook Model estimates of landed catch stock composition for Terminal Sport 1979-2012

APPENDIX F: INCIDENTAL MORTALITY RATES APPLIED IN THE CTC MODEL

Appendix F. Incidental mortality rates applied in the CTC model. Rates in original model were applied to all years. In the current model, rates in some fisheries vary in accordance to changes in management regulations.

		Rates in original Model			Rates applied in Model CLB1308			
Fishery Number	Fishery	Sublegal Rate	Legal Rate	Dropoff	Sublegal Rate	Legal Rate	Dropoff	Applicable Years
1	Alaska T	0.3	0.3	0	0.255	0.211	0.008	All
2	North T	0.3	0.3	0	0.255	0.211	0.017	1979–1995
2	North T				0.220	0.185	0.016	1996–current
3	Centr T	0.3	0.3	0	0.255	0.211	0.017	1979–1995
3	Centr T				0.220	0.185	0.016	1996–current
4	WCVI T	0.3	0.3	0	0.255	0.211	0.017	1979–1997
4	WCVI T				0.220	0.185	0.016	1998–current
5	WA/OR T	0.3	0.3	0	0.255	0.211	0.017	1979–1983
5	WA/OR T				0.220	0.185	0.016	1984–current
6	Str of Geo T	0.3	0.3	0	0.255	0.211	0.017	1979–1985,1987–1996
6	Str of Geo T				0.220	0.185	0.016	1986, 1998–current
7	Alaska N	0.9	0.9	0	0.9	0.9	0	All
8	North N	0.9	0.9	0	0.9	0.9	0	All
9	Centr N	0.9	0.9	0	0.9	0.9	0	All
10	WCVI N	0.9	0.9	0	0.9	0.9	0	All
11	J De F N	0.9	0.9	0	0.9	0.9	0	All
12	PgtNth N	0.9	0.9	0	0.9	0.9	0	All
13	PgtSth N	0.9	0.9	0	0.9	0.9	0	All
14	WashCst N	0.9	0.9	0	0.9	0.9	0	All
15	Col R N	0.9	0.9	0	0.9	0.9	0	All
16	John St N	0.9	0.9	0	0.9	0.9	0	All
17	Fraser N	0.9	0.9	0	0.9	0.9	0	All
18	Alaska S	0.3	0.3	0	0.123	0.123	0.036	All
19	Nor/Cen S	0.3	0.3	0	0.123	0.123	0.036	All
20	WCVI S	0.3	0.3	0	0.123	0.123	0.069	All
21	WashOcn S	0.3	0.3	0	0.123	0.123	0.069	All
22	PgtNth S	0.3	0.3	0	0.123	0.123	0.145	All
23	PgtSth S	0.3	0.3	0	0.123	0.123	0.145	All
24	Str of Geo S	0.3	0.3	0	0.322	0.322	0.069	1979–1981
24	Str of Geo S				0.123	0.123	0.069	1982–current
25	Col R S	0.3	0.3	0	0.123	0.123	0.069	All

APPENDIX G: TIME SERIES OF ABUNDANCE INDICES

Appendix G. Time series of abundance indices from 1979 to 2013 for SEAK, NBC, and WCVI AABM fisheries as estimated by CTC Chinook Model calibrations CLB1309 (1979-2014).

Year	Alaska T	North T	WCVI T
1979	0.96	1.03	1.11
1980	1.02	0.97	0.96
1981	0.92	0.94	0.92
1982	1.10	1.06	1.00
1983	1.29	1.21	0.93
1984	1.45	1.37	0.99
1985	1.31	1.29	0.96
1986	1.48	1.45	1.03
1987	1.73	1.72	1.20
1988	2.12	1.83	1.15
1989	1.84	1.66	1.00
1990	1.87	1.63	0.91
1991	1.79	1.52	0.77
1992	1.67	1.40	0.80
1993	1.66	1.41	0.70
1994	1.56	1.23	0.53
1995	1.05	0.96	0.42
1996	0.93	0.92	0.50
1997	1.23	1.10	0.60
1998	1.18	1.00	0.57
1999	1.09	0.95	0.51
2000	0.98	0.94	0.53
2001	1.17	1.21	0.81
2002	1.76	1.70	1.18
2003	2.21	1.92	1.24
2004	2.03	1.78	1.03
2005	1.80	1.54	0.84
2006	1.51	1.24	0.66
2007	1.15	0.92	0.53
2008	0.88	0.80	0.57
2009	1.04	0.95	0.57
2010	1.13	1.09	0.78
2011	1.42	1.22	0.82
2012	1.24	1.15	0.76
2013[1]	1.42	1.27	0.91
2014	1.75	1.41	0.89

Note: This time series is NOT the first postseason AI for each year and is for trend analysis only (Figures 3.10–3.12). For evaluation of overage and underage, use the first postseason AI instead (Source 1309 PABD).

[1] Due to a change in modeling assumptions, calibration 1309 AIs differ from the final 2013 preseason AIs (based on CLB 1308).

APPENDIX H: ABUNDANCE INDICES IN TOTAL AND BY MODEL STOCK FOR AABM FISHERIES, FROM CALIBRATION 1309

LIST OF APPENDIX H TABLES

Table H1. Abundance indices (AIs) for the Southeast Alaska troll fishery by model stock and year (stock groups 1–15 this page; 16–30 on following page), from CLB 1309. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.

Year	Alaska South SE	North/Centr	Fraser Early	Fraser Late	WCVI Hatchery	WCVI Natural	St. of Georgia Upper	St. of Georgia Lwr Nat	St. of Georgia Lwr Hat	Nooksack Fall	Pgt Sd Fing	Pgt Sd NatF	Pgt Sd Year	Nooksack Spring	Skagit Wild	AI Total
1979	0.03	0.12	0.06	0.00	0.05	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96
1980	0.03	0.13	0.05	0.00	0.10	0.15	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02
1981	0.04	0.13	0.04	0.00	0.08	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92
1982	0.04	0.14	0.04	0.00	0.19	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10
1983	0.05	0.16	0.04	0.00	0.31	0.15	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29
1984	0.06	0.18	0.05	0.00	0.29	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45
1985	0.06	0.20	0.07	0.00	0.15	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.31
1986	0.07	0.22	0.07	0.00	0.12	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48
1987	0.07	0.23	0.07	0.00	0.09	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73
1988	0.06	0.24	0.07	0.00	0.21	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12
1989	0.04	0.25	0.06	0.00	0.31	0.07	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.84
1990	0.03	0.26	0.06	0.00	0.47	0.10	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.87
1991	0.03	0.27	0.06	0.00	0.59	0.13	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79
1992	0.03	0.26	0.06	0.00	0.55	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67
1993	0.04	0.24	0.06	0.00	0.51	0.13	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.66
1994	0.03	0.22	0.06	0.00	0.42	0.11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56
1995	0.03	0.23	0.07	0.00	0.15	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05
1996	0.03	0.23	0.08	0.00	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93
1997	0.03	0.23	0.09	0.00	0.17	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23
1998	0.03	0.23	0.08	0.00	0.27	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18
1999	0.04	0.24	0.07	0.00	0.14	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09
2000	0.05	0.25	0.07	0.00	0.05	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98
2001	0.05	0.25	0.08	0.00	0.07	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17
2002	0.04	0.25	0.10	0.00	0.23	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76
2003	0.04	0.24	0.10	0.00	0.36	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21
2004	0.04	0.25	0.09	0.00	0.36	0.03	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03
2005	0.04	0.24	0.09	0.00	0.26	0.02	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80
2006	0.05	0.22	0.10	0.00	0.23	0.03	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51
2007	0.05	0.21	0.08	0.00	0.24	0.03	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15
2008	0.03	0.19	0.08	0.00	0.12	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88
2009	0.03	0.18	0.08	0.00	0.10	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04
2010	0.03	0.17	0.10	0.00	0.11	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13
2011	0.03	0.15	0.09	0.00	0.24	0.03	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42
2012	0.02	0.14	0.06	0.00	0.17	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24

-continued-

Table H1. Page 2 of 2 (stock groups 16–30).

Year	Stillaguamish Wild	Snohomish Wild	WA Coastal Hat	UpRiver Brights	Spring Creek Hat	Lwr Bonneville Hat	Fall Cowlitz Hat	Lewis R Wild	Willamette R	Spr Cowlitz Hat	Col R Summer	Oregon Coast	WA Coastal Wild	Lyons Ferry	Mid-Col R Brights	AI Total
1979	0.00	0.00	0.03	0.18	0.00	0.00	0.03	0.02	0.02	0.00	0.04	0.23	0.03	0.00	0.00	0.96
1980	0.00	0.00	0.03	0.14	0.00	0.00	0.03	0.02	0.03	0.00	0.04	0.17	0.04	0.00	0.00	1.02
1981	0.00	0.00	0.02	0.10	0.00	0.00	0.03	0.02	0.03	0.01	0.03	0.16	0.04	0.00	0.01	0.92
1982	0.00	0.00	0.02	0.06	0.00	0.00	0.03	0.01	0.03	0.00	0.02	0.19	0.03	0.00	0.01	1.10
1983	0.00	0.00	0.02	0.09	0.00	0.00	0.03	0.01	0.04	0.00	0.03	0.25	0.03	0.00	0.02	1.29
1984	0.00	0.00	0.02	0.20	0.00	0.00	0.03	0.01	0.04	0.00	0.03	0.35	0.03	0.00	0.02	1.45
1985	0.00	0.00	0.02	0.23	0.00	0.00	0.03	0.01	0.03	0.00	0.02	0.32	0.04	0.00	0.01	1.31
1986	0.00	0.00	0.02	0.33	0.00	0.00	0.03	0.01	0.04	0.00	0.03	0.35	0.05	0.00	0.02	1.48
1987	0.00	0.00	0.04	0.48	0.00	0.00	0.03	0.02	0.05	0.01	0.03	0.40	0.06	0.00	0.07	1.73
1988	0.00	0.00	0.05	0.51	0.00	0.00	0.14	0.04	0.06	0.00	0.03	0.38	0.07	0.00	0.13	2.12
1989	0.00	0.00	0.06	0.32	0.00	0.00	0.05	0.04	0.06	0.00	0.03	0.30	0.08	0.00	0.12	1.84
1990	0.00	0.00	0.05	0.24	0.00	0.00	0.02	0.02	0.07	0.00	0.02	0.31	0.07	0.00	0.08	1.87
1991	0.00	0.00	0.05	0.12	0.00	0.00	0.01	0.01	0.05	0.00	0.02	0.29	0.06	0.00	0.05	1.79
1992	0.00	0.00	0.05	0.10	0.00	0.00	0.02	0.01	0.03	0.00	0.02	0.26	0.05	0.00	0.04	1.67
1993	0.00	0.00	0.05	0.18	0.00	0.00	0.01	0.01	0.03	0.00	0.02	0.25	0.05	0.00	0.05	1.66
1994	0.00	0.00	0.05	0.21	0.00	0.00	0.01	0.01	0.02	0.00	0.02	0.27	0.05	0.00	0.05	1.56
1995	0.00	0.00	0.04	0.12	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.21	0.04	0.00	0.04	1.05
1996	0.00	0.00	0.04	0.13	0.00	0.00	0.02	0.01	0.02	0.00	0.02	0.17	0.04	0.00	0.05	0.93
1997	0.00	0.00	0.03	0.18	0.00	0.00	0.01	0.01	0.02	0.00	0.02	0.20	0.04	0.00	0.09	1.23
1998	0.00	0.00	0.02	0.12	0.00	0.00	0.00	0.01	0.02	0.00	0.02	0.16	0.04	0.00	0.06	1.18
1999	0.00	0.00	0.02	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.02	0.16	0.03	0.00	0.06	1.09
2000	0.00	0.00	0.02	0.18	0.00	0.00	0.01	0.01	0.03	0.00	0.04	0.13	0.03	0.00	0.05	0.98
2001	0.00	0.00	0.02	0.20	0.00	0.00	0.01	0.01	0.03	0.00	0.07	0.19	0.03	0.00	0.07	1.17
2002	0.00	0.00	0.03	0.33	0.00	0.00	0.02	0.02	0.07	0.00	0.10	0.27	0.03	0.00	0.16	1.76
2003	0.00	0.00	0.03	0.48	0.00	0.00	0.05	0.02	0.05	0.00	0.10	0.36	0.04	0.00	0.22	2.21
2004	0.00	0.00	0.04	0.37	0.00	0.00	0.03	0.02	0.06	0.00	0.09	0.39	0.04	0.00	0.16	2.03
2005	0.00	0.00	0.04	0.37	0.00	0.00	0.03	0.01	0.02	0.00	0.09	0.32	0.04	0.00	0.13	1.80
2006	0.00	0.00	0.04	0.26	0.00	0.00	0.02	0.02	0.03	0.00	0.08	0.20	0.04	0.00	0.11	1.51
2007	0.00	0.00	0.03	0.12	0.00	0.00	0.01	0.00	0.01	0.00	0.07	0.12	0.03	0.00	0.08	1.15
2008	0.00	0.00	0.03	0.13	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.05	0.03	0.00	0.09	0.88
2009	0.00	0.00	0.03	0.22	0.00	0.00	0.02	0.01	0.02	0.00	0.08	0.08	0.03	0.00	0.11	1.04
2010	0.00	0.00	0.03	0.23	0.00	0.00	0.01	0.01	0.05	0.00	0.09	0.11	0.03	0.00	0.09	1.13
2011	0.00	0.00	0.03	0.32	0.00	0.00	0.04	0.01	0.04	0.00	0.10	0.14	0.03	0.01	0.12	1.42
2012	0.00	0.00	0.03	0.28	0.00	0.00	0.02	0.01	0.03	0.00	0.08	0.17	0.03	0.01	0.10	1.24

Table H2. Abundance indices (AIs) for the Northern B.C. troll fishery by stock and year (stock groups 1–15 this page; 16–30 on following page), from CLB 1309. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.

Year	Alaska South SE	North/Centr	Fraser Early	Fraser Late	WCVI Hatchery	WCVI Natural	St. of Georgia Upper	St. of Georgia Lwr Nat	St. of Georgia Lwr Hat	Nooksack Fall	Pgt Sd Fing	Pgt Sd NatF	Pgt Sd Year	Nooksack Spring	Skagit Wild	AI Total
1979	0.00	0.08	0.07	0.01	0.04	0.05	0.06	0.02	0.02	0.01	0.00	0.00	0.00	0.02	0.01	1.03
1980	0.00	0.08	0.06	0.01	0.05	0.08	0.05	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.97
1981	0.00	0.09	0.05	0.01	0.06	0.08	0.06	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.94
1982	0.00	0.10	0.04	0.01	0.12	0.11	0.05	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.06
1983	0.00	0.11	0.05	0.01	0.17	0.08	0.04	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	1.21
1984	0.00	0.12	0.06	0.02	0.15	0.05	0.05	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.37
1985	0.00	0.13	0.07	0.01	0.08	0.03	0.06	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.01	1.29
1986	0.00	0.14	0.09	0.01	0.06	0.02	0.06	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	1.45
1987	0.00	0.15	0.08	0.01	0.07	0.02	0.07	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.72
1988	0.00	0.16	0.08	0.01	0.12	0.03	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.83
1989	0.00	0.17	0.08	0.01	0.19	0.04	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.66
1990	0.00	0.17	0.08	0.01	0.27	0.06	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.63
1991	0.00	0.17	0.08	0.01	0.32	0.07	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.52
1992	0.00	0.17	0.07	0.01	0.31	0.07	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.40
1993	0.00	0.16	0.07	0.01	0.28	0.07	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.41
1994	0.00	0.16	0.08	0.00	0.20	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.23
1995	0.00	0.15	0.08	0.00	0.07	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.96
1996	0.00	0.15	0.09	0.01	0.04	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.92
1997	0.00	0.16	0.11	0.01	0.11	0.03	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.10
1998	0.00	0.16	0.10	0.01	0.13	0.03	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.00
1999	0.00	0.16	0.09	0.01	0.07	0.01	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.95
2000	0.00	0.16	0.08	0.01	0.03	0.00	0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.94
2001	0.00	0.17	0.09	0.01	0.06	0.01	0.07	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.21
2002	0.00	0.17	0.11	0.01	0.14	0.02	0.07	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.70
2003	0.00	0.17	0.12	0.01	0.19	0.02	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.92
2004	0.00	0.18	0.11	0.01	0.20	0.02	0.08	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	1.78
2005	0.00	0.17	0.10	0.01	0.14	0.01	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	1.54
2006	0.00	0.16	0.11	0.01	0.14	0.02	0.08	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	1.24
2007	0.00	0.15	0.10	0.00	0.11	0.01	0.06	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.92
2008	0.00	0.13	0.10	0.00	0.07	0.01	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.80
2009	0.00	0.12	0.10	0.00	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95
2010	0.00	0.12	0.11	0.01	0.08	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09
2011	0.00	0.11	0.11	0.01	0.12	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22
2012	0.00	0.10	0.09	0.00	0.08	0.01	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15

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Table H2. Page 2 of 2 (stock groups 16–30).

Year	Stillaguamish Wild	Snohomish Wild	WA Coastal Hat	UpRiver Brights	Spring Creek Hat	Lwr Bonneville Hat	Fall Cowlitz Hat	Lewis R Wild	Willamette R	Spr Cowlitz Hat	Col R Summer	Oregon Coast	WA Coastal Wild	Lyons Ferry	Mid-Col R Brights	AI Total
1979	0.00	0.01	0.04	0.12	0.00	0.00	0.02	0.01	0.06	0.01	0.02	0.30	0.05	0.00	0.00	1.03
1980	0.00	0.01	0.04	0.09	0.00	0.00	0.02	0.01	0.06	0.01	0.02	0.25	0.06	0.00	0.00	0.97
1981	0.00	0.00	0.04	0.06	0.00	0.00	0.02	0.01	0.07	0.01	0.02	0.24	0.06	0.00	0.01	0.94
1982	0.00	0.00	0.03	0.04	0.00	0.00	0.02	0.01	0.09	0.01	0.02	0.30	0.06	0.00	0.01	1.06
1983	0.00	0.00	0.03	0.07	0.00	0.00	0.02	0.01	0.09	0.01	0.02	0.39	0.06	0.00	0.02	1.21
1984	0.00	0.00	0.03	0.14	0.00	0.00	0.02	0.01	0.09	0.01	0.02	0.49	0.06	0.00	0.01	1.37
1985	0.00	0.00	0.03	0.16	0.00	0.00	0.02	0.01	0.08	0.00	0.02	0.45	0.06	0.00	0.01	1.29
1986	0.00	0.00	0.05	0.24	0.00	0.00	0.02	0.01	0.10	0.01	0.02	0.49	0.08	0.00	0.02	1.45
1987	0.00	0.00	0.07	0.33	0.00	0.00	0.03	0.02	0.13	0.01	0.02	0.53	0.10	0.00	0.05	1.72
1988	0.00	0.00	0.09	0.32	0.00	0.00	0.08	0.02	0.14	0.01	0.02	0.47	0.12	0.00	0.09	1.83
1989	0.00	0.00	0.09	0.20	0.00	0.00	0.02	0.01	0.14	0.01	0.02	0.40	0.12	0.00	0.07	1.66
1990	0.00	0.00	0.08	0.15	0.00	0.00	0.01	0.01	0.14	0.00	0.01	0.40	0.11	0.00	0.05	1.63
1991	0.00	0.00	0.08	0.08	0.00	0.00	0.01	0.01	0.10	0.00	0.01	0.37	0.10	0.00	0.03	1.52
1992	0.00	0.00	0.09	0.07	0.00	0.00	0.01	0.01	0.07	0.01	0.01	0.34	0.09	0.00	0.03	1.40
1993	0.00	0.00	0.08	0.12	0.00	0.00	0.01	0.00	0.06	0.00	0.01	0.36	0.08	0.00	0.03	1.41
1994	0.00	0.00	0.07	0.13	0.00	0.00	0.00	0.01	0.05	0.00	0.01	0.32	0.07	0.00	0.03	1.23
1995	0.00	0.00	0.07	0.08	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.29	0.07	0.00	0.03	0.96
1996	0.00	0.00	0.06	0.09	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.24	0.07	0.00	0.04	0.92
1997	0.00	0.00	0.05	0.12	0.00	0.00	0.01	0.00	0.05	0.00	0.01	0.26	0.07	0.00	0.06	1.10
1998	0.00	0.00	0.03	0.08	0.00	0.00	0.00	0.00	0.05	0.00	0.02	0.22	0.05	0.00	0.04	1.00
1999	0.00	0.00	0.03	0.14	0.00	0.00	0.01	0.00	0.06	0.00	0.02	0.19	0.04	0.00	0.04	0.95
2000	0.00	0.00	0.03	0.11	0.00	0.00	0.00	0.00	0.07	0.00	0.04	0.23	0.04	0.00	0.03	0.94
2001	0.00	0.00	0.03	0.15	0.00	0.00	0.01	0.01	0.11	0.00	0.05	0.30	0.04	0.00	0.05	1.21
2002	0.00	0.00	0.04	0.24	0.00	0.00	0.02	0.01	0.15	0.00	0.06	0.44	0.05	0.00	0.11	1.70
2003	0.00	0.00	0.05	0.31	0.00	0.00	0.03	0.01	0.13	0.01	0.06	0.51	0.06	0.00	0.14	1.92
2004	0.00	0.00	0.06	0.24	0.00	0.00	0.01	0.01	0.10	0.01	0.06	0.49	0.07	0.00	0.10	1.78
2005	0.00	0.00	0.06	0.24	0.00	0.00	0.02	0.01	0.06	0.00	0.05	0.39	0.07	0.01	0.08	1.54
2006	0.00	0.00	0.06	0.16	0.00	0.00	0.01	0.00	0.05	0.01	0.05	0.23	0.06	0.01	0.07	1.24
2007	0.00	0.00	0.05	0.08	0.00	0.00	0.00	0.00	0.03	0.00	0.05	0.13	0.05	0.01	0.05	0.92
2008	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.04	0.00	0.05	0.08	0.04	0.00	0.06	0.80
2009	0.00	0.00	0.05	0.15	0.00	0.00	0.01	0.00	0.08	0.00	0.05	0.12	0.05	0.01	0.07	0.95
2010	0.00	0.00	0.05	0.16	0.00	0.00	0.01	0.00	0.10	0.00	0.06	0.18	0.05	0.01	0.06	1.09
2011	0.00	0.00	0.05	0.21	0.00	0.00	0.02	0.01	0.08	0.00	0.06	0.21	0.05	0.01	0.08	1.22
2012	0.00	0.00	0.05	0.20	0.00	0.00	0.01	0.01	0.07	0.00	0.06	0.24	0.05	0.01	0.07	1.15

Table H3. Abundance indices (AIs) for the WCVI troll fishery by stock and year stock groups 1–15 this page; 16–30 on following page), from CLB 1309. Numbers shown represent the portion of the AI total estimated for each model stock; the summation across all 30 stock groups equals the AI total for each calendar year.

Year	Alaska South SE	North/Centr	Fraser Early	Fraser Late	WCVI Hatchery	WCVI Natural	St. of Georgia Upper	St. of Georgia Lwr Nat	St. of Georgia Lwr Hat	Nooksack Fall	Pgt Sd Fing	Pgt Sd NatF	Pgt Sd Year	Nooksack Spring	Skagit Wild	AI Total
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.01	0.28	0.01	0.02	0.00	0.01	0.01	0.08	0.04	0.03	0.02	0.00	0.02	1.11
1981	0.00	0.00	0.01	0.21	0.02	0.02	0.00	0.01	0.01	0.09	0.04	0.02	0.02	0.00	0.02	0.96
1982	0.00	0.00	0.00	0.24	0.02	0.03	0.00	0.00	0.01	0.09	0.04	0.02	0.02	0.00	0.02	0.92
1983	0.00	0.00	0.00	0.25	0.04	0.03	0.00	0.00	0.01	0.09	0.04	0.02	0.02	0.00	0.01	1.01
1984	0.00	0.00	0.01	0.22	0.05	0.02	0.00	0.00	0.00	0.10	0.06	0.03	0.02	0.00	0.01	0.92
1985	0.00	0.00	0.01	0.25	0.04	0.01	0.00	0.00	0.01	0.11	0.06	0.02	0.02	0.00	0.02	0.99
1986	0.00	0.00	0.01	0.28	0.03	0.01	0.00	0.00	0.01	0.09	0.05	0.02	0.01	0.00	0.01	0.97
1987	0.00	0.00	0.01	0.23	0.02	0.01	0.00	0.00	0.00	0.08	0.06	0.03	0.01	0.00	0.01	1.05
1988	0.00	0.00	0.01	0.11	0.02	0.01	0.00	0.00	0.00	0.06	0.08	0.03	0.01	0.00	0.01	1.21
1989	0.00	0.00	0.01	0.07	0.04	0.01	0.00	0.00	0.00	0.05	0.09	0.03	0.01	0.00	0.01	1.14
1990	0.00	0.00	0.01	0.18	0.06	0.01	0.00	0.00	0.00	0.06	0.10	0.03	0.02	0.00	0.01	0.99
1991	0.00	0.00	0.01	0.21	0.09	0.02	0.00	0.00	0.00	0.07	0.10	0.03	0.01	0.00	0.01	0.90
1992	0.00	0.00	0.01	0.16	0.09	0.02	0.00	0.00	0.00	0.04	0.07	0.03	0.01	0.00	0.00	0.77
1993	0.00	0.00	0.01	0.21	0.09	0.02	0.00	0.00	0.00	0.03	0.06	0.02	0.01	0.00	0.00	0.80
1994	0.00	0.00	0.01	0.17	0.09	0.02	0.00	0.00	0.00	0.03	0.06	0.02	0.01	0.00	0.00	0.70
1995	0.00	0.00	0.01	0.10	0.05	0.01	0.00	0.00	0.00	0.02	0.06	0.02	0.01	0.00	0.00	0.53
1996	0.00	0.00	0.01	0.05	0.01	0.00	0.00	0.00	0.00	0.02	0.08	0.02	0.01	0.00	0.00	0.43
1997	0.00	0.00	0.01	0.08	0.02	0.00	0.00	0.00	0.00	0.02	0.07	0.01	0.01	0.00	0.00	0.50
1998	0.00	0.00	0.01	0.17	0.04	0.01	0.00	0.00	0.00	0.03	0.06	0.01	0.01	0.00	0.01	0.59
1999	0.00	0.00	0.01	0.18	0.04	0.01	0.00	0.00	0.00	0.03	0.06	0.01	0.00	0.00	0.00	0.57
2000	0.00	0.00	0.01	0.11	0.01	0.00	0.00	0.00	0.00	0.03	0.08	0.01	0.01	0.00	0.01	0.51
2001	0.00	0.00	0.01	0.12	0.01	0.00	0.00	0.00	0.00	0.03	0.08	0.01	0.01	0.00	0.01	0.54
2002	0.00	0.00	0.01	0.12	0.02	0.00	0.00	0.00	0.00	0.04	0.09	0.02	0.01	0.00	0.01	0.84
2003	0.00	0.00	0.01	0.19	0.05	0.01	0.00	0.00	0.00	0.04	0.09	0.02	0.01	0.00	0.01	1.17
2004	0.00	0.00	0.01	0.23	0.06	0.01	0.00	0.00	0.00	0.02	0.09	0.01	0.01	0.00	0.01	1.22
2005	0.00	0.00	0.01	0.15	0.05	0.00	0.00	0.00	0.00	0.02	0.09	0.02	0.01	0.00	0.01	1.02
2006	0.00	0.00	0.01	0.09	0.04	0.00	0.00	0.00	0.00	0.02	0.10	0.01	0.02	0.00	0.01	0.84
2007	0.00	0.00	0.01	0.10	0.04	0.01	0.00	0.00	0.00	0.02	0.11	0.01	0.02	0.00	0.01	0.66
2008	0.00	0.00	0.01	0.07	0.03	0.00	0.00	0.00	0.00	0.02	0.12	0.02	0.03	0.00	0.01	0.53
2009	0.00	0.00	0.01	0.08	0.02	0.00	0.00	0.00	0.00	0.02	0.10	0.01	0.02	0.00	0.01	0.57
2010	0.00	0.00	0.01	0.06	0.02	0.00	0.00	0.00	0.00	0.02	0.09	0.01	0.02	0.00	0.01	0.57
2011	0.00	0.00	0.01	0.14	0.03	0.00	0.00	0.00	0.00	0.03	0.09	0.01	0.02	0.00	0.00	0.79
2012	0.00	0.00	0.01	0.14	0.04	0.00	0.00	0.00	0.00	0.03	0.09	0.01	0.02	0.00	0.01	0.82

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Table H3. Page 2 of 2 (stock groups 16–30).

Year	Stillaguamish Wild	Snohomish Wild	WA Coastal Hat	UpRiver Brights	Spring Creek Hat	Lwr Bonneville Hat	Fall Cowlitz Hat	Lewis R Wild	Willamette R	Spr Cowlitz Hat	Col R Summer	Oregon Coast	WA Coastal Wild	Lyons Ferry	Mid-Col R Brights	AI Total
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1980	0.00	0.01	0.01	0.06	0.17	0.14	0.09	0.01	0.01	0.01	0.02	0.04	0.01	0.00	0.00	1.11
1981	0.00	0.01	0.01	0.04	0.14	0.10	0.09	0.01	0.01	0.02	0.02	0.04	0.01	0.00	0.00	0.96
1982	0.00	0.01	0.01	0.03	0.12	0.09	0.08	0.01	0.02	0.01	0.02	0.04	0.01	0.00	0.01	0.92
1983	0.00	0.01	0.01	0.03	0.13	0.10	0.09	0.01	0.02	0.01	0.01	0.05	0.01	0.00	0.01	1.01
1984	0.00	0.01	0.01	0.05	0.04	0.09	0.08	0.01	0.02	0.01	0.02	0.06	0.01	0.00	0.00	0.92
1985	0.00	0.01	0.01	0.08	0.05	0.08	0.07	0.01	0.02	0.01	0.02	0.07	0.01	0.00	0.00	0.99
1986	0.00	0.00	0.01	0.10	0.03	0.07	0.08	0.01	0.02	0.01	0.01	0.07	0.02	0.00	0.02	0.97
1987	0.00	0.00	0.01	0.15	0.02	0.12	0.09	0.01	0.02	0.01	0.02	0.07	0.02	0.00	0.04	1.05
1988	0.00	0.00	0.02	0.18	0.01	0.25	0.18	0.02	0.03	0.01	0.02	0.07	0.02	0.00	0.04	1.21
1989	0.00	0.00	0.02	0.14	0.03	0.12	0.28	0.02	0.03	0.01	0.02	0.07	0.03	0.00	0.03	1.14
1990	0.00	0.00	0.02	0.09	0.04	0.05	0.13	0.01	0.03	0.01	0.01	0.06	0.03	0.00	0.02	0.99
1991	0.00	0.00	0.02	0.06	0.04	0.03	0.06	0.01	0.03	0.01	0.01	0.06	0.02	0.00	0.01	0.90
1992	0.00	0.00	0.02	0.04	0.05	0.05	0.04	0.01	0.02	0.01	0.01	0.05	0.02	0.00	0.02	0.77
1993	0.00	0.00	0.02	0.05	0.04	0.06	0.05	0.01	0.01	0.01	0.01	0.05	0.02	0.00	0.02	0.80
1994	0.00	0.00	0.02	0.06	0.02	0.03	0.04	0.00	0.01	0.00	0.01	0.05	0.02	0.00	0.01	0.70
1995	0.00	0.00	0.01	0.05	0.02	0.02	0.02	0.01	0.01	0.00	0.01	0.05	0.02	0.00	0.01	0.53
1996	0.00	0.00	0.01	0.04	0.02	0.02	0.03	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.02	0.43
1997	0.00	0.00	0.01	0.06	0.03	0.02	0.04	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.03	0.50
1998	0.00	0.00	0.01	0.05	0.02	0.02	0.03	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.02	0.59
1999	0.00	0.00	0.01	0.05	0.02	0.02	0.02	0.00	0.01	0.00	0.01	0.03	0.01	0.00	0.02	0.57
2000	0.00	0.00	0.01	0.07	0.03	0.01	0.02	0.00	0.01	0.00	0.02	0.03	0.01	0.00	0.02	0.51
2001	0.00	0.00	0.01	0.06	0.02	0.02	0.02	0.01	0.01	0.00	0.03	0.03	0.01	0.00	0.04	0.54
2002	0.00	0.00	0.01	0.10	0.10	0.06	0.04	0.01	0.03	0.00	0.04	0.05	0.01	0.01	0.07	0.84
2003	0.00	0.00	0.01	0.14	0.18	0.08	0.07	0.01	0.03	0.01	0.06	0.07	0.01	0.01	0.06	1.17
2004	0.00	0.00	0.01	0.14	0.19	0.06	0.11	0.01	0.03	0.01	0.05	0.08	0.01	0.01	0.05	1.22
2005	0.00	0.00	0.01	0.13	0.17	0.04	0.09	0.01	0.02	0.01	0.05	0.07	0.02	0.01	0.04	1.02
2006	0.00	0.00	0.01	0.11	0.10	0.02	0.08	0.01	0.01	0.01	0.05	0.05	0.01	0.01	0.03	0.84
2007	0.00	0.00	0.01	0.07	0.03	0.01	0.04	0.00	0.01	0.01	0.05	0.03	0.01	0.01	0.03	0.66
2008	0.00	0.00	0.01	0.04	0.02	0.01	0.02	0.00	0.01	0.00	0.04	0.02	0.01	0.01	0.03	0.53
2009	0.00	0.00	0.01	0.07	0.06	0.02	0.02	0.00	0.01	0.00	0.04	0.01	0.01	0.01	0.03	0.57
2010	0.00	0.00	0.01	0.08	0.04	0.01	0.04	0.00	0.02	0.00	0.05	0.02	0.01	0.01	0.03	0.57
2011	0.00	0.00	0.01	0.10	0.09	0.02	0.05	0.00	0.02	0.00	0.05	0.03	0.01	0.01	0.04	0.79
2012	0.00	0.00	0.01	0.11	0.06	0.02	0.09	0.01	0.02	0.00	0.05	0.03	0.01	0.02	0.04	0.82

Appendix I: Fishery exploitation rate indices by stock, age and fishery, based on CWT data, 1975–2011.

LIST OF APPENDIX I TABLES

Table I1. Alaska troll Stratified Proportion Fishery Index (SPFI) values as landed catch, based on CWT data.

YEAR	SPFI	WIN/SPR	JUNE IN	JUNE OUT	JULY IN	JULY OUT	FALL
1979	0.8131	1.1282	0.5177	1.0798	0.3822	0.7709	0.7709
1980	1.2919	0.6395	1.4586	0.9509	1.8606	1.5645	1.5645
1981	1.0997	1.2270	0.9145	1.0699	0.8558	1.0532	1.0532
1982	0.7953	1.0053	1.1092	0.8994	0.9014	0.6114	0.6114
1983	0.8665	1.0570	0.6747	0.5967	0.7950	1.2217	1.2217
1984	0.6155	0.3652	1.1556	0.9418	0.2730	0.5204	0.5204
1985	0.6729	0.4484	0.8822	0.5931	0.6999	0.8214	0.8214
1986	0.4532	0.4366	0.4243	0.1557	0.5249	1.2471	1.2471
1987	0.4743	0.5889	0.5889	0.1683	1.2746	0.6278	0.6278
1988	0.4130	1.3749	0.1425	0.0014	1.1381	0.6441	0.6441
1989	0.5012	0.8389	0.4570	0.2041	0.4915	0.5312	0.5312
1990	0.6926	0.6408	0.9163	0.1121	1.0531	1.1143	1.1143
1991	0.5907	1.3592	0.9455	0.2199	0.4866	0.7496	0.7496
1992	0.3788	1.0335	0.5345	0.0658	0.2028	0.3849	0.3849
1993	0.4137	0.7442	0.2904	0.0153	0.2419	0.8744	0.8744
1994	0.3983	0.6643	0.1163	0.0370	0.1500	0.6473	0.6473
1995	0.4899	0.4631	0.3232	0.0507	0.8689	0.7585	0.7585
1996	0.4135	0.5628	0.6349	0.0853	0.4621	0.5383	0.5383
1997	0.5844	0.6322	0.6342	0.1382	0.0780	1.4675	1.4675
1998	0.3826	0.7999	0.1444	0.0522	0.3707	0.9504	0.9504
1999	0.5676	0.7801	0.2855	0.1033	0.1071	0.9562	0.9562
2000	0.4274	0.8858	0.1040	0.0794	0.0537	1.4168	1.4168
2001	0.3735	0.5728	0.1301	0.0708	0.1244	0.6352	0.6352
2002	0.4910	0.4251	0.1013	0.0607	0.1473	1.1168	1.1168
2003	0.4757	0.7097	0.1361	0.0688	0.3045	0.8544	0.8544
2004	0.4276	0.8324	0.1873	0.0735	0.2800	0.9260	0.9260
2005	0.4550	0.9244	0.1945	0.1183	0.4011	1.2158	1.2158
2006	0.6124	1.5479	0.7413	0.1165	0.1103	1.3763	1.3763
2007	0.5883	1.3052	0.9653	0.1355	0.1739	1.1205	1.1205
2008	0.4235	0.8456	0.7882	0.0687	0.0860	0.6769	0.6769
2009	0.5703	0.7029	0.3653	0.1496	0.1463	1.0582	1.0582
2010	0.3611	1.1285	0.3610	0.0404	0.0824	0.7073	0.7073
2011	0.3170	0.9606	0.2046	0.0424	0.1007	0.7301	0.7301

ER Stock Identifiers			
Alaska Southeast	Age 4	Age 5	Age 6
Quinsam	Age 4	Age 5	
Robertson Creek	Age 3	Age 4	Age 5
Salmon River Hatchery	Age 4	Age 5	
Columbia Upriver Brights	Age 4	Age 5	
Willamette Spring Hatchery	Age 4	Age 5	

Table I2. Alaska troll Stratified Proportion Fishery Index (SPFI) values as total mortality, based on CWT data.

YEAR	SPFI	WIN/SPR	JUNE IN	JUNE OUT	JULY IN	JULY OUT	FALL
1979	0.7899	1.0865	0.5061	1.0708	0.3797	0.7403	0.7403
1980	1.2201	0.6409	1.4790	0.9151	1.7645	1.4170	1.4170
1981	1.0989	1.2206	0.8842	1.1002	0.8043	1.0643	1.0643
1982	0.8911	1.0521	1.1307	0.9139	1.0514	0.7784	0.7784
1983	0.9802	1.0207	0.7234	0.6082	0.7239	1.6356	1.6356
1984	0.6518	0.3716	1.1330	0.9381	0.4213	0.6118	0.6118
1985	0.7740	0.4646	0.8425	0.5755	0.6795	1.0718	1.0718
1986	0.5157	0.4865	0.4357	0.1542	0.6049	1.4656	1.4656
1987	0.5429	0.6026	0.5384	0.1597	1.6734	0.7569	0.7569
1988	0.4259	1.2953	0.1533	0.0114	1.2276	0.6538	0.6538
1989	0.5613	0.8083	0.4422	0.2026	0.5666	0.6087	0.6087
1990	0.8650	0.7973	0.9735	0.1274	1.0337	1.4407	1.4407
1991	0.6122	1.2770	0.8723	0.2072	0.6120	0.7841	0.7841
1992	0.4323	0.9816	0.4944	0.0621	0.2102	0.5488	0.5488
1993	0.4566	0.7131	0.2656	0.0162	0.2434	1.0220	1.0220
1994	0.4758	0.6420	0.1415	0.0370	0.1968	0.8373	0.8373
1995	0.5785	0.4681	0.3362	0.0521	0.8846	0.9192	0.9192
1996	0.4944	0.5627	0.6037	0.0908	0.4871	0.6637	0.6637
1997	0.5786	0.6207	0.5789	0.1364	0.0958	1.4150	1.4150
1998	0.3656	0.7744	0.1445	0.0529	0.3241	0.8913	0.8913
1999	0.6184	0.7700	0.2702	0.0994	0.1447	1.0608	1.0608
2000	0.4470	0.8874	0.1066	0.0855	0.0814	1.4673	1.4673
2001	0.3896	0.5548	0.1211	0.0679	0.1536	0.6668	0.6668
2002	0.4834	0.4531	0.1023	0.0636	0.1632	1.0568	1.0568
2003	0.4611	0.7230	0.1307	0.0697	0.2777	0.8021	0.8021
2004	0.4188	0.8218	0.1763	0.0741	0.2776	0.8852	0.8852
2005	0.4697	1.0145	0.2501	0.1224	0.3722	1.1945	1.1945
2006	0.6123	1.4989	0.7280	0.1173	0.1174	1.3574	1.3574
2007	0.5823	1.2787	0.9621	0.1315	0.1641	1.0946	1.0946
2008	0.4352	0.8080	0.7235	0.0711	0.1093	0.6997	0.6997
2009	0.5843	0.7184	0.3536	0.1436	0.1682	1.0714	1.0714
2010	0.3754	1.1347	0.3495	0.0424	0.0886	0.7326	0.7326
2011	0.3096	0.9026	0.1887	0.0395	0.0976	0.7154	0.7154

ER Stock Identifiers			
Alaska Southeast	Age 4	Age 5	Age 6
Quinsam	Age 4	Age 5	
Robertson Creek	Age 3	Age 4	Age 5
Salmon River Hatchery	Age 4	Age 5	
Columbia Upriver Brights	Age 4	Age 5	
Willamette Spring Hatchery	Age 4	Age 5	

Table I3. Landed catch exploitation rate indices by stock and age in the NBC troll fishery, based on CWT data. Base period is 1979–1982.

	ER Stock Identifiers[1]												
	AKS	QUI	QUI	RBT	RBT	RBT	SRH	SRH	SRH	URB	URB	WSH	Fishery
Year	Age 4	Age 3	Age 4	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5	Age 4	Age 5	Age 4	Index
1979		0.5510	0.8718	1.1531	0.8274	0.4793	1.1800			1.1917		0.6463	0.8339
1980		0.8007	0.9775	1.0492	0.8534	0.7707		0.9276		0.9893	1.2710	1.1841	0.9429
1981		1.7646	1.4512	0.8536	1.0407	1.7500	1.3089		1.0000	1.1512	1.3118	1.5272	1.2628
1982	1.0000	0.8838	0.6995	0.9441	1.2784		0.5111	1.0724		0.6678	0.4172	0.6424	0.8412
1983	1.5922	1.2412	1.4711	0.9826	0.7324	0.7472	0.5739	1.1720	0.2433	1.3045		1.2691	0.8031
1984	1.1231	0.2515	0.5020	0.3869	1.3672	1.6702		1.4222	1.2803	2.1053		0.4595	1.2144
1985	0.7726	0.2518	0.5805	0.9467	1.8650	1.6956	0.3934		1.2260	1.7148	1.6791	0.2010	1.2211
1986	0.7135	0.9365	0.8469		0.9164		0.1131	1.1439		1.2496	1.9961		1.0107
1987	0.5971	0.3481	0.6218	0.4490			0.2034	0.7955	1.0121	1.7646	2.0835		0.9404
1988	1.9823	0.1845	0.6967	0.3027	0.6197			0.6540	0.3360	1.0783	2.3568	0.7874	0.6958
1989	0.9049	0.4339	0.4475	0.3690	0.8762	1.0483	0.1357	0.5667	0.9968	1.0273	[illegible].2322	0.3660	0.9802
1990	1.9064	0.3558	0.9622	0.2800	0.7116	0.5506	0.1769	0.5073	0.9242	1.2459	2.3862	0.3030	0.7986
1991	0.6355	0.4220	0.6669	0.3512	0.7109	1.0942	0.1347	0.8443	0.9549			0.2775	0.7441
1992	0.1138		1.8662	0.2688	0.5723	0.6314	0.1224	0.5190	0.4480			0.1003	0.5756
1993	0.2671			0.1485	0.6249	0.8366	0.1325	1.1340	1.0304	1.1664		0.2092	0.7788
1994	0.0498			0.2884	0.7537	0.8564	0.2194	1.1164	0.9365	0.9472	2.0801	0.1175	0.8642
1995	0.0000				0.4137	0.2331	0.1280	0.0000	0.3981		0.5720	0.1519	0.3006
1996	0.0000			0.0000			0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
1997		0.3509	0.2542	0.2061	0.3120		0.2170	0.2317	0.1812	0.5450		0.1340	0.2553
1998	0.0000		0.0000		0.4911		0.0756	1.1232	0.5922		1.2611	0.0000	0.5527
1999	0.0000	0.1655	0.1930		0.3369	0.5500	0.1057	0.4059	0.2297	1.1973		0.0000	0.3563
2000	0.0000	0.0000	0.0626				0.0493	0.5744	0.1579	0.0000	0.0000	0.0137	0.1397
2001		0.0000	0.0149	0.0000			0.0482	0.3597	0.4181	0.0000		0.0208	0.2016
2002	0.4663		0.1415	0.0000	0.4642		0.1909	0.6251	0.7023	0.2106		0.1864	0.4289
2003	0.0000	0.0000	0.0000	0.0435	0.0514	0.0000	0.0540	0.6393	0.2538	0.7563	1.0825	0.0525	0.2497
2004	0.9023	0.0000	0.0570	0.0845	0.1957	0.4271	0.0939	0.5337	0.4382	0.7488	1.3801	0.1907	0.3988
2005	0.1789	0.0749	0.0431	0.0310	0.3222	0.1039	0.1141	0.9562	0.4545	1.4960	1.0650	0.0958	0.4303
2006	0.3737	0.0817	0.0674	0.0944	0.2582	0.2676	0.0381	1.0029	0.7293	1.4005	1.5138	0.0481	0.5379
2007	0.0882		0.4450		0.4860	0.4982	0.0000	0.5975	0.6790			0.0000	0.4866
2008	0.1032	0.0000		0.0805	0.6214	0.1899	0.0751	0.6972				0.0502	0.3087
2009	0.8952		0.1066	0.1878	0.2055		0.0138	1.3476	0.9605	1.9228		0.0340	0.6907
2010	0.1935	0.0000		0.1413	0.0869		0.1961	1.0643	0.4235			0.1310	0.3515
2011	0.0000	0.0000	0.0000	0.0000	0.3325		0.0169	0.7983	0.5450	0.5716		0.1260	0.3520

[1] Stock Identifiers: AKS = ALASKA SPRING; QUI = QUINSAM; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; URB = COLUMBIA UPRIVER BRIGHT; WSH = WILLAMETTE SPRING

Table I4. NBC troll fishery Stratified Proportion Fishery Index (SPFI) values as landed catch, based on CWT data.

YEAR	SPFI
1979	0.9470
1980	0.8084
1981	1.2639
1982	0.9807
1983	0.9316
1984	0.9218
1985	0.8990
1986	0.7293
1987	0.7195
1988	0.6477
1989	0.6525
1990	0.5687
1991	0.6268
1992	0.4334
1993	0.4947
1994	0.5955
1995	0.2604
1996	0.0000
1997	0.2109
1998	0.3994
1999	0.3015
2000	0.0850
2001	0.0796
2002	0.3045
2003	0.2096
2004	0.2731
2005	0.3893
2006	0.3809
2007	0.3332
2008	0.2589
2009	0.5269
2010	0.3082
2011	0.2380

ER Stock Identifiers			
Alaska Southeast	Age 4	Age 5	Age 6
Quinsam	Age 4	Age 5	
Robertson Creek	Age 3	Age 4	Age 5
Salmon River Hatchery	Age 4	Age 5	
Columbia Upriver Brights	Age 4	Age 5	
Willamette Spring Hatchery	Age 4	Age 5	

Table I5. Total mortality exploitation rate indices by stock and age in the NBC troll fishery, based on CWT data. Base period is 1979–1982.

	ER Stock Identifiers[1]												
Year	AKS Age 4	QUI Age 3	QUI Age 4	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 4	URB Age 5	WSH Age 4	Fishery Index
1979		0.5670	0.8599	1.1626	0.8328	0.4758	1.1811			1.1968		0.6283	0.8389
1980		0.8089	0.9813	1.0240	0.8544	0.7651		0.9342		0.9889	1.2674	1.1458	0.9411
1981		1.7505	1.4516	0.8503	1.0357	1.7592	1.2925		1.0000	1.1573	1.3236	1.5229	1.2627
1982	1.0000	0.8736	0.7072	0.9631	1.2771		0.5264	1.0658		0.6571	0.4090	0.7030	0.8429
1983	1.6361	1.2223	1.4806	0.9749	0.7338	0.7555	0.6349	1.1719	0.2398	1.2836		1.2499	0.8109
1984	1.1322	0.2620	0.5122	0.4902	1.3680	1.6816		1.4265	1.2814	2.1232		0.4610	1.2111
1985	0.8049	0.2748	0.5814	1.0924	1.8601	1.7214	0.4404		1.2268	1.7176	1.6459	0.1930	1.2187
1986	0.7308	0.9433	0.8353		0.9138		0.1620	1.1408		1.2652	1.9565		1.0012
1987	0.6704	0.4732	0.6667	0.4911			0.3239	0.8279	1.0159	1.8284	2.1102		0.9684
1988	2.1987	0.2966	0.7249	0.3500	0.6400			0.6773	0.3311	1.1413	2.3879	0.8961	0.7231
1989	0.9546	0.5003	0.4729	0.4410	0.8837	1.0586	0.2951	0.6068	1.0082	1.1048	4.2385	0.3829	1.0011
1990	2.3376	0.5295	1.0084	0.3817	0.7361	0.5642	0.3309	0.5448	0.9433	1.3373	2.4429	0.3325	0.8419
1991	0.7387	0.5797	0.6877	0.4682	0.7276	1.1160	0.3216	0.8722	0.9689			0.3045	0.7803
1992	0.2101		1.9746	0.4116	0.5998	0.6541	0.1918	0.5402	0.4599			0.1224	0.6075
1993	0.2465			0.3256	0.6495	0.8591	0.2978	1.1657	1.0472	1.2327		0.2350	0.8150
1994	0.1149			0.5059	0.7827	0.8742	0.4148	1.1446	0.9438	0.9868	2.1408	0.1311	0.9024
1995	0.0777				0.4312	0.2534	0.2350	0.0344	0.4255		0.6117	0.2115	0.3343
1996	0.1288			0.0674			0.0808	0.0280	0.0277	0.0642		0.0561	0.0464
1997		0.3829	0.2508	0.2568	0.3166		0.2356	0.2389	0.1786	0.5554		0.1373	0.2634
1998	0.0000		0.0000		0.4999		0.2031	1.1317	0.5949		1.2361	0.0000	0.5596
1999	0.0000	0.1847	0.1904		0.3292	0.5566	0.1377	0.4104	0.2264	1.2145		0.0000	0.3554
2000	0.0000	0.0000	0.0618				0.0725	0.5716	0.1556	0.0000	0.0000	0.0140	0.1388
2001		0.0000	0.0147	0.0000			0.0706	0.3637	0.4120	0.0000		0.0201	0.1963
2002	0.6026		0.1396	0.0316	0.4742		0.2427	0.6350	0.7108	0.2210		0.2122	0.4375
2003	0.0801	0.0000	0.0000	0.0445	0.0538	0.0000	0.1059	0.6538	0.2558	0.7805	1.1003	0.0576	0.2548
2004	0.9995	0.0000	0.0563	0.1297	0.2086	0.4462	0.1722	0.5614	0.4586	0.7651	1.4339	0.2071	0.4177
2005	0.2311	0.0668	0.0425	0.0635	0.3312	0.1032	0.2299	0.9901	0.4678	1.5649	1.1185	0.0981	0.4484
2006	0.4743	0.0729	0.0665	0.1345	0.2599	0.2656	0.1366	1.0011	0.7319	1.4379	1.5073	0.0615	0.5404
2007	0.1139		0.4389		0.4900	0.4945	0.0437	0.6033	0.6820			0.0000	0.4841
2008	0.0953	0.0000		0.1235	0.6429	0.1885	0.1277	0.7014				0.0571	0.3164
2009	0.9487		0.1052	0.1976	0.2008		0.1116	1.3595	0.9668	1.9517		0.0290	0.6913
2010	0.2144	0.0000		0.1690	0.0849		0.2168	1.0683	0.4290			0.1331	0.3515
2011	0.0609	0.0000	0.0000	0.0678	0.3649		0.0478	0.8631	0.5897	0.6267		0.1324	0.3809

[1] Stock Identifiers: AKS = ALASKA SPRING; QUI = QUINSAM; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; URB = COLUMBIA UPRIVER BRIGHT; WSH = WILLAMETTE SPRING

Table I6. NBC troll fishery Stratified Proportion Fishery Index (SPFI) values as total mortality, based on CWT data.

YEAR	SPFI
1979	0.9457
1980	0.7948
1981	1.2741
1982	0.9855
1983	0.9404
1984	0.9099
1985	0.8804
1986	0.7344
1987	0.8019
1988	0.7006
1989	0.7271
1990	0.6429
1991	0.6328
1992	0.4830
1993	0.5366
1994	0.5796
1995	0.2800
1996	0.0000
1997	0.1994
1998	0.3809
1999	0.2925
2000	0.1001
2001	0.0982
2002	0.3267
2003	0.2217
2004	0.2958
2005	0.3915
2006	0.3765
2007	0.3387
2008	0.2861
2009	0.5224
2010	0.3371
2011	0.2501

ER Stock Identifiers			
Alaska Southeast	Age 4	Age 5	Age 6
Quinsam	Age 4	Age 5	
Robertson Creek	Age 3	Age 4	Age 5
Salmon River Hatchery	Age 4	Age 5	
Columbia Upriver Brights	Age 4	Age 5	
Willamette Spring Hatchery	Age 4	Age 5	

Table I7. Landed catch exploitation rate indices by stock and age in the WCVI troll fishery, based on CWT data. Base period is 1979–1982.

Year	CWF Age 4	GAD Age 3	GAD Age 4	LRH Age 3	LRH Age 4	LRW Age 4	RBT Age 3	RBT Age 4	RBT Age 5	SAM Age 3	SAM Age 4	SAM Age 5	SPR Age 3	SPR Age 4	SPS Age 3	SPS Age 4	SRH Age 3	SRH Age 4	SUM Age 4	URB Age 3	URB Age 4	UWA Age 3	UWA Age 4	WSH Age 4	Fishery Index
	ER Stock Identifiers[1]																								
1979				1.10			1.20	1.25			1.00	1.00	0.94	0.83		1.13	1.53			1.37	1.75	0.69	1.23	1.00	1.05
1980				0.57	0.99		1.38	1.42					1.17	1.41				1.10	0.69	1.32	0.95	1.37	0.86	1.10	1.04
1981	0.79	0.72		1.15	0.74	0.85	0.66	0.60	1.00				0.93	0.62	0.73		0.47		1.31	0.27	0.88	0.83	0.87	0.64	0.85
1982	1.21	1.28	1.00	1.17	1.27	1.15	0.75	0.72		1.00			0.96	1.14	1.27	0.87		0.90		1.05	0.41	1.11	1.04	1.27	1.06
1983	1.38		1.41	1.66	1.58	0.96	0.45	0.83	1.87		0.96		1.41	0.93	1.58	0.89	1.42			0.38	0.43	0.71	1.08	0.30	1.16
1984	1.32	1.89		2.11	2.76		1.31	1.11	1.08			1.08	1.25	1.33	1.57	0.96		0.42		0.88	1.27	1.67	0.75	0.64	1.40
1985	0.92		0.84	1.25	1.11		0.49	0.00					0.56	0.92	0.81	0.65				0.84	1.03	0.78	1.03	0.43	0.86
1986	1.32			1.18	1.14	0.47		1.10					1.17	0.99	0.91	1.06		0.18		1.45	1.41	0.85	1.08		1.06
1987	0.89			1.24		1.50	0.30						0.46		0.94	0.53	0.37	0.25		1.19	0.86	0.46	0.43		0.71
1988	0.92	0.53		1.38	1.45	1.11	0.49	0.60		0.75			1.00		0.41	0.72		0.69	1.20	0.56	2.04		0.81	0.95	0.99
1989	0.55	0.40	0.50	0.33	0.59	0.59	0.24	0.34	0.00	0.38	0.61		0.63	0.40	0.42	0.39	0.39		0.78		0.95			0.56	0.50
1990	0.76	1.17	0.95	1.20	0.45	1.24	0.71	0.53	1.55	0.51	0.86		0.95	0.74	0.99	0.84	0.81	0.46	1.50		1.68			0.90	0.91
1991			0.98	0.77		0.77	0.66	0.55	1.40	0.45	0.58	1.09	0.62	0.64	0.56	0.54	0.95	0.39	0.48					0.09	0.70
1992	1.17		0.34	0.79		0.34	1.89	2.51	5.24	1.02	0.27		0.52	0.76	0.82	0.73	1.41	2.56	0.81					0.25	0.84
1993				1.25	0.73		1.48	2.36	2.53	1.22	0.44		0.61	1.02	1.16	0.53	1.53	1.17		0.95	2.05			0.47	0.93
1994	0.12					0.24	0.70	0.73	1.33	0.27	0.71		0.87	0.66	0.26	0.46		0.41			1.00			0.28	0.56
1995		0.32				0.48		0.48	0.36	0.27	0.41		0.43	0.38	0.35	0.28	0.10							0.15	0.36
1996	0.03	0.07	0.03	0.06			0.04			0.07	0.02		0.04		0.07	0.02	0.06	0.01	0.03	0.09	0.06			0.03	0.04
1997	0.38		0.22	0.91			0.01	0.04		0.09	0.25		0.56	0.44	0.15	0.31	0.00	0.03	0.07		0.07			0.00	0.34
1998								0.00			0.08		0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.01				0.03	0.03
1999		0.04		0.08					0.00		0.07		0.01		0.02	0.05	0.00	0.00	0.03		0.00			0.00	0.04
2000			1.21	0.08	1.67						1.08		0.05	0.74	0.03	0.70	0.00	0.00	0.21	0.11	0.50			0.07	0.68
2001		0.67	1.26	0.27	0.84	0.70	0.00			0.37	0.36		0.14	0.58	0.43	0.54	0.00	0.05	0.45	0.11	0.17			0.16	0.52
2002	0.57	0.16	0.62	0.27	0.36		0.01	0.00		0.22	0.40		0.26	0.68	0.37	0.48	0.00	0.00	0.50	0.08	0.27			0.27	0.40
2003	0.53	0.10	0.71	0.25	0.72	0.12	0.00	0.00			0.57		0.27	0.57	0.32	0.54	0.00	0.00	0.57	0.16	0.10			0.54	0.45
2004		0.07	1.18	0.36	0.99	0.12	0.03	0.02	0.00	0.16	0.56		0.32	0.80	0.31	0.82	0.17	0.26	0.26	0.14	0.48			2.07	0.58
2005	0.30	0.65	0.97	0.61	1.62	0.12	0.00	0.00		0.10	0.79		0.81	1.17	0.50	0.75	0.15	0.24	0.49	0.12	0.45			1.14	0.74
2006		0.24	0.93			0.45	0.00	0.00	0.00	0.35	0.75		0.52	1.39	0.46	0.71	0.15	0.28	0.33		0.71			1.34	0.68
2007		0.85	0.79	0.63				0.02		1.08	0.56		0.55	0.90	0.87	0.68	0.00	0.00	0.46		0.13			0.20	0.63
2008		0.39	0.37	0.40			0.00		0.00	0.62	0.33		0.19		0.44	0.31	0.21	0.00	0.25	0.27				0.16	0.31
2009	0.00	0.51	0.50	0.21	0.22			0.00		0.56	0.15		0.14	0.05	0.50	0.18	0.04	0.04	0.35		0.11			0.09	0.21
2010	0.11	0.83	0.44	0.31			0.04	0.25		0.85	0.13		0.22	0.33	0.43	0.12	0.00	0.00	0.20	0.11				0.20	0.26
2011	0.07	0.30	0.22	0.34	0.68		0.00	0.00		0.00	0.40		0.23	0.57	0.05	0.20	0.03	0.49	0.20	0.00	0.33			0.39	0.30

[1] Stock Identifiers: CWF = COWLITZ FALL TULE; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; WSH = WILLAMETTE SPRING; GAD = G ADAMS FALL FING; SAM = SAMISH FALL FING; SUM = COL RIVER SUMMERS; CHI = CHILLAWACK; LRH = LOWER RIVER TULE; SPR = SPRING CREEK TULE; URB = COLUMBIA UPRIVER BRIGHT; LRW = LEWIS RIVER WILD; SPS = SO SOUND FALL FING; UWA = U OF W FALL ACCEL (*discontinued*)

Table I8. WCVI troll fishery Stratified Proportion Fishery Index (SPFI) values as landed catch, based on CWT data.

YEAR	SPFI
1979	1.0735
1980	1.1676
1981	0.8636
1982	0.8952
1983	0.9953
1984	1.3398
1985	1.2227
1986	0.9086
1987	1.3795
1988	1.6955
1989	0.8191
1990	1.1115
1991	0.5797
1992	1.6674
1993	0.7258
1994	0.5114
1995	0.5872
1996	0.0000
1997	0.4070
1998	0.0167
1999	0.1710
2000	0.6828
2001	0.2191
2002	0.2118
2003	0.5262
2004	0.3999
2005	0.6072
2006	0.4179
2007	0.3785
2008	0.3594
2009	0.1225
2010	0.1087
2011	0.2016

ER Stock Identifiers			
Cowlitz Fall Tule	Age 4		
George Adams	Age 3	Age 4	
Lower River Hatchery	Age 3	Age 4	
Lewis River Wild	Age 4		
Robertson Creek	Age 3	Age 4	Age 5
Samish	Age 3	Age 4	
Spring Creek	Age 3	Age 4	
South Puget Sound Fingerling	Age 3	Age 4	
Salmon River Hatchery	Age 3	Age 4	Age 5
Columbia River Summers	Age 4		
Columbia Upriver Brights	Age 3	Age 4	
U of WA Accel. (*discontinued*)	Age 3	Age 4	
Willamette Spring Hatchery	Age 4		
Chilliwack	Age 3	Age 4	

Table I9. Total mortality exploitation rate indices by stock and age in the WCVI troll fishery, based on CWT data. Base period is 1979–1982.

	Stock Identifiers[1]																								
Year	CWF Age 4	GAD Age 3	GAD Age 4	LRH Age 3	LRH Age 4	LRW Age 4	RBT Age 3	RBT Age 4	RBT Age 5	SAM Age 3	SAM Age 4	SAM Age 5	SPR Age 3	SPR Age 4	SPS Age 3	SPS Age 4	SRH Age 3	SRH Age 4	SUM Age 4	URB Age 3	URB Age 4	UWA Age 3	UWA Age 4	WSH Age 4	Fishery Index
1979				1.1037			1.2033	1.2541			1.0000	1.0000	0.9439	0.8294		1.1332	1.5304			1.3664	1.7541	0.6897	1.2270	1.0004	1.0500
1980				0.5678	0.9854		1.3821	1.4242					1.1658	1.4102				1.1006	0.6875	1.3154	0.9485	1.3688	0.8620	1.0960	1.0400
1981	0.7860	0.7196		1.1540	0.7410	0.8487	0.6636	0.5977	1.0000				0.9274	0.6224	0.7331		0.4696		1.3125	0.2665	0.8837	0.8329	0.8669	0.6360	0.8468
1982	1.2140	1.2804	1.0000	1.1744	1.2736	1.1513	0.7510	0.7240		1.0000			0.9629	1.1380	1.2669	0.8668		0.8994		1.0517	0.4137	1.1086	1.0440	1.2676	1.0602
1983	1.3803		1.4051	1.6578	1.5765	0.9615	0.4497	0.8349	1.8740		0.9567		1.4109	0.9277	1.5788	0.8864	1.4171			0.3768	0.4259	0.7112	1.0766	0.3022	1.1647
1984	1.3152	1.8893		2.1105	2.7623		1.3118	1.1118	1.0771			1.0844	1.2498	1.3326	1.5681	0.9623		0.4197		0.8760	1.2716	1.6689	0.7468	0.6417	1.4001
1985	0.9153		0.8355	1.2524	1.1135		0.4911	0.0000					0.5583	0.9191	0.8097	0.6538				0.8443	1.0336	0.7787	1.0275	0.4333	0.8608
1986	1.3181			1.1831	1.1441	0.4727		1.0956					1.1736	0.9898	0.9133	1.0586		0.1811		1.4481	1.4137	0.8492	1.0836		1.0631
1987	0.8915			1.2415		1.5027	0.2966						0.4568		0.9362	0.5252	0.3738	0.2493		1.1875	0.8567	0.4559	0.4327		0.7068
1988	0.9240	0.5258		1.3844	1.4522	1.1074	0.4941	0.5989		0.7540			1.0049		0.4093	0.7203		0.6866	1.2036	0.5640	2.0420		0.8109	0.9497	0.9897
1989	0.5549	0.3965	0.4996	0.3336	0.5866	0.5909	0.2383	0.3387	0.0000	0.3769	0.6123		0.6328	0.4012	0.4200	0.3878	0.3945		0.7794		0.9546			0.5639	0.5048
1990	0.7647	1.1692	0.9488	1.2020	0.4545	1.2376	0.7114	0.5322	1.5462	0.5122	0.8637		0.9450	0.7420	0.9877	0.8437	0.8076	0.4553	1.5019		1.6840			0.8998	0.9086
1991			0.9780	0.7685		0.7694	0.6627	0.5543	1.4026	0.4546	0.5813	1.0913	0.6236	0.6424	0.5613	0.5366	0.9517	0.3850	0.4849					0.0877	0.7021
1992	1.1689		0.3403	0.7855		0.3359	1.8927	2.5077	5.2377	1.0153	0.2729		0.5163	0.7638	0.8163	0.7273	1.4141	2.5565	0.8080					0.2473	0.8397
1993				1.2519	0.7285		1.4825	2.3589	2.5348	1.2238	0.4435		0.6103	1.0219	1.1644	0.5291	1.5266	1.1682		0.9517	2.0474			0.4675	0.9336
1994	0.1154					0.2438	0.7015	0.7277	1.3286	0.2673	0.7093		0.8663	0.6560	0.2576	0.4595		0.4148			1.0010			0.2757	0.5604
1995		0.3214				0.4818		0.4752	0.3579	0.2693	0.4125		0.4303	0.3813	0.3473	0.2759	0.0977							0.1485	0.3645
1996	0.0339	0.0737	0.0254	0.0607			0.0361			0.0680	0.0155		0.0430		0.0697	0.0212	0.0574	0.0124	0.0286	0.0937	0.0606			0.0291	0.0376
1997	0.3830		0.2179	0.9133			0.0051	0.0414		0.0891	0.2482		0.5637	0.4431	0.1522	0.3058	0.0000	0.0310	0.0657		0.0724			0.0000	0.3401
1998								0.0000			0.0812		0.0405	0.0000	0.0000	0.0295	0.0000	0.0000	0.0000	0.0136				0.0316	0.0270
1999		0.0398		0.0809					0.0000		0.0711		0.0142		0.0173	0.0527	0.0000	0.0000	0.0254		0.0000			0.0000	0.0418
2000			1.2076	0.0789	1.6681						1.0786		0.0494	0.7374	0.0300	0.7026	0.0000	0.0000	0.2087	0.1056	0.5000			0.0690	0.6757
2001		0.6662	1.2550	0.2657	0.8440	0.6983	0.0000			0.3672	0.3556		0.1422	0.5821	0.4316	0.5382	0.0000	0.0539	0.4498	0.1144	0.1658			0.1636	0.5186
2002	0.5706	0.1573	0.6182	0.2739	0.3611		0.0145	0.0000		0.2193	0.3973		0.2569	0.6839	0.3685	0.4810	0.0000	0.0000	0.4991	0.0791	0.2740			0.2690	0.4047
2003	0.5282	0.0961	0.7103	0.2503	0.7224	0.1206	0.0000	0.0000			0.5706		0.2661	0.5706	0.3177	0.5443	0.0000	0.0000	0.5745	0.1568	0.1029			0.5371	0.4505
2004		0.0654	1.1826	0.3597	0.9905	0.1207	0.0298	0.0204	0.0000	0.1556	0.5633		0.3248	0.7973	0.3102	0.8188	0.1707	0.2589	0.2597	0.1441	0.4817			2.0695	0.5824
2005	0.2970	0.6548	0.9678	0.6148	1.6190	0.1193	0.0000	0.0000		0.0994	0.7857		0.8059	1.1712	0.5007	0.7533	0.1452	0.2368	0.4892	0.1157	0.4522			1.1435	0.7422
2006		0.2368	0.9275			0.4493	0.0000	0.0000	0.0000	0.3453	0.7512		0.5221	1.3857	0.4648	0.7114	0.1455	0.2802	0.3254		0.7073			1.3388	0.6762
2007		0.8495	0.7864	0.6280				0.0178		1.0846	0.5599		0.5525	0.9004	0.8727	0.6835	0.0000	0.0000	0.4572		0.1274			0.2002	0.6333
2008		0.3931	0.3725	0.3969			0.0000		0.0000	0.6158	0.3266		0.1946		0.4365	0.3105	0.2101	0.0000	0.2472	0.2721				0.1553	0.3060
2009	0.0000	0.5108	0.5037	0.2053	0.2247			0.0000		0.5566	0.1521		0.1427	0.0528	0.4991	0.1794	0.0352	0.0380	0.3470		0.1129			0.0902	0.2130
2010	0.1067	0.8327	0.4380	0.3120			0.0362	0.2496		0.8486	0.1275		0.2196	0.3332	0.4282	0.1183	0.0000	0.0000	0.1979	0.1125				0.1987	0.2637
2011	0.0699	0.2957	0.2207	0.3441	0.6826		0.0000	0.0000		0.0000	0.4000		0.2305	0.5657	0.0467	0.2006	0.0331	0.4925	0.1958	0.0000	0.3339			0.3924	0.3011

[1] Stock identifiers: CWF = COWLITZ FALL TULE; RBT = ROBERTSON CREEK; SRH = SALMON RIVER HATCHERY; WSH = WILLAMETTE SPRING; GAD = G ADAMS FALL FING; SAM = SAMISH FALL FING; SUM = COL RIVER SUMMERS; CHI = CHILLAWACK; LRH = LOWER RIVER TULE; SPR = SPRING CREEK TULE; URB = COLUMBIA UPRIVER BRIGHT; LRW = LEWIS RIVER WILD; SPS = SO SOUND FALL FING; UWA = U OF W FALL ACCEL (*discontinued*)

Table I10. WCVI troll fishery Stratified Proportion Fishery Index (SPFI) values as total mortality, based on CWT data.

YEAR	SPFI
1979	1.0589
1980	1.1578
1981	0.8761
1982	0.9072
1983	0.9727
1984	1.3404
1985	1.2066
1986	0.9007
1987	1.5724
1988	1.7908
1989	0.9498
1990	1.1438
1991	0.6252
1992	1.7207
1993	0.7486
1994	0.5185
1995	0.6934
1996	0.0000
1997	0.3912
1998	0.0154
1999	0.1618
2000	0.6425
2001	0.2073
2002	0.2002
2003	0.4961
2004	0.3772
2005	0.5732
2006	0.3938
2007	0.3561
2008	0.3382
2009	0.1154
2010	0.1025
2011	0.1898

ER Stock Identifiers			
Cowlitz Fall Tule	Age 4		
George Adams	Age 3	Age 4	
Lower River Hatchery	Age 3	Age 4	
Lewis River Wild	Age 4		
Robertson Creek	Age 3	Age 4	Age 5
Samish	Age 3	Age 4	
Spring Creek	Age 3	Age 4	
South Puget Sound Fingerling	Age 3	Age 4	
Salmon River Hatchery	Age 3	Age 4	Age 5
Columbia River Summers	Age 4		
Columbia Upriver Brights	Age 3	Age 4	
U of WA Accel. (*discontinued*)	Age 3	Age 4	
Willamette Spring Hatchery	Age 4		
Chilliwack	Age 3	Age 4	

Appendix J. Preseason forecasts and postseason estimates for PSC model stocks, 1999–2012.

Appendix J. Preseason forecasts and postseason estimates for PSC model stocks, 1999–2012.

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
AKS[1] (Alaska SSE)	1999	11,866	n/a	12,654	n/a	n/a	94%
	2000	18,967	n/a	15,909	n/a	n/a	119%
	2001	22,130	n/a	21,226	n/a	n/a	104%
	2002	15,650	n/a	19,473	n/a	n/a	80%
	2003	22,316	n/a	14,206	n/a	n/a	157%
	2004	11,880	n/a	16,420	n/a	n/a	72%
	2005	25,204	n/a	16,102	n/a	n/a	157%
	2006	17,966	n/a	20,866	n/a	n/a	86%
	2007	25,653	n/a	15,095	n/a	n/a	170%
	2008	14,626	n/a	13,865	n/a	n/a	105%
	2009	14,362	n/a	11,296	n/a	n/a	127%
	2010	16,445	n/a	16,194	n/a	n/a	102%
	2011	17,065	n/a	11,938	n/a	n/a	143%
	2012	12,557	n/a	6,784	n/a	n/a	185%
	2013	4,838	n/a		n/a	n/a	
	AVG.				n/a	n/a	122%
NTH[2] (North/ Central B.C.)	1999	149,593	n/a	150,775	n/a	n/a	99%
	2000	159,818	n/a	185,147	n/a	n/a	86%
	2001	189,088	n/a	228,774	n/a	n/a	83%
	2002	228,073	n/a	136,625	n/a	n/a	167%
	2003	154,103	n/a	166,568	n/a	n/a	93%
	2004	171,070	n/a	152,207	n/a	n/a	112%
	2005	154,552	n/a	127,075	n/a	n/a	122%
	2006	132,710	n/a	151,812	n/a	n/a	87%
	2007	156,017	n/a	123,565	n/a	n/a	126%
	2008	131,262	n/a	105,806	n/a	n/a	124%
	2009	119,761	n/a	126,605	n/a	n/a	95%
	2010	136,998	n/a	113,361	n/a	n/a	121%
	2011	119,323	n/a	95,175	n/a	n/a	125%
	2012	98,010	n/a	78,714	n/a	n/a	125%
	2013	86,819	n/a		n/a		
	AVG.				n/a	n/a	112%
RBH+RBT[2] (WCVI Hatchery + Natural)	1999	78,074	68,400	98,400	114%	70%	79%
	2000	21,040	15,040	37,090	140%	41%	57%
	2001	33,702	30,633	86,787	110%	35%	39%
	2002	128,068	109,882	109,882	117%	100%	117%
	2003	111,430	105,801	215,345	105%	49%	52%
	2004	166,548	144,180	247,500	116%	58%	67%
	2005	244,768	218,840	154,594	112%	142%	158%
	2006	152,483	138,878	197,097	110%	70%	77%
	2007	151,925	117,321	118,082	129%	99%	129%
	2008	67,347	60,255	98,744	112%	61%	68%
	2009	76,063	58,382	88,429	130%	66%	86%
	2010	75,748	61,586	92,534	123%	67%	82%
	2011	98,929	74,708	161,914	132%	46%	61%
	2012	70,838	54,765	84,432	129%	65%	84%
	2013	32,180	n/a		n/a		
	AVG.				120%	69%	83%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
GSQ[1] (Upper Strait of Georgia)	1999	16,472	n/a	16,142	n/a	n/a	102%
	2000	19,452	n/a	22,200	n/a	n/a	88%
	2001	25,828	n/a	35,620	n/a	n/a	73%
	2002	41,492	n/a	29,986	n/a	n/a	138%
	2003	36,882	n/a	31,059	n/a	n/a	119%
	2004	39,766	n/a	28,359	n/a	n/a	140%
	2005	38,798	n/a	31,517	n/a	n/a	123%
	2006	39,171	n/a	33,024	n/a	n/a	119%
	2007	41,711	n/a	22,674	n/a	n/a	184%
	2008	30,065	n/a	20,641	n/a	n/a	146%
	2009	26,173	n/a	19,923	n/a	n/a	131%
	2010	26,624	n/a	18,523	n/a	n/a	144%
	2011	23,998	n/a	19,469	n/a	n/a	123%
	2012	25,756	n/a	24,304	n/a	n/a	106%
	2013	31,498	n/a		n/a		
	AVG.				n/a	n/a	124%
GSH[2] (Lower Strait of Georgia Hatchery)	1999	23,648	n/a	20,000	n/a	n/a	118%
	2000	19,165	n/a	20,286	n/a	n/a	94%
	2001	17,547	n/a	27,458	n/a	n/a	64%
	2002	25,051	n/a	23,557	n/a	n/a	106%
	2003	21,222	n/a	24,084	n/a	n/a	88%
	2004	16,573	n/a	22,119	n/a	n/a	75%
	2005	21,046	n/a	28,226	n/a	n/a	75%
	2006	18,169	n/a	22,756	n/a	n/a	80%
	2007	24,378	n/a	13,155	n/a	n/a	185%
	2008	11,765	n/a	13,410	n/a	n/a	88%
	2009	17,551	n/a	14,398	n/a	n/a	122%
	2010	7,999	n/a	14,360	n/a	n/a	56%
	2011	14,671	n/a	9,555	n/a	n/a	154%
	2012	10,104	n/a	8,449	n/a	n/a	120%
	2013	5,568	n/a		n/a		
	AVG.				n/a	n/a	102%
GST[1] (Lower Strait of Georgia Natural)	1999	14,737	n/a	9,032	n/a	n/a	163%
	2000	11,094	n/a	8,119	n/a	n/a	137%
	2001	7,955	n/a	8,836	n/a	n/a	90%
	2002	8,833	n/a	8,188	n/a	n/a	108%
	2003	8,088	n/a	5,374	n/a	n/a	151%
	2004	5,157	n/a	3,700	n/a	n/a	139%
	2005	4,459	n/a	5,415	n/a	n/a	82%
	2006	4,070	n/a	7,469	n/a	n/a	54%
	2007	7,782	n/a	4,778	n/a	n/a	163%
	2008	6,823	n/a	4,926	n/a	n/a	139%
	2009	5,701	n/a	2,966	n/a	n/a	192%
	2010	2,972	n/a	5,676	n/a	n/a	52%
	2011	10,778	n/a	7,873	n/a	n/a	137%
	2012	11,433	n/a	6,070	n/a	n/a	188%
	2013	8,267	n/a		n/a		
	AVG.				n/a	n/a	128%

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Appendix J. Page 3 of 9.

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
FRE[2] (Fraser Early)	1999	163,342	n/a	106,000	n/a	n/a	154%
	2000	118,058	n/a	116,750	n/a	n/a	101%
	2001	122,333	n/a	180,952	n/a	n/a	68%
	2002	170,232	n/a	214,347	n/a	n/a	79%
	2003	202,363	n/a	188,183	n/a	n/a	108%
	2004	185,450	n/a	141,029	n/a	n/a	131%
	2005	151,591	n/a	134,461	n/a	n/a	113%
	2006	141,517	n/a	203,212	n/a	n/a	70%
	2007	196,060	n/a	110,884	n/a	n/a	177%
	2008	128,347	n/a	148,284	n/a	n/a	87%
	2009	153,593	n/a	134,307	n/a	n/a	114%
	2010	144,214	n/a	171,819	n/a	n/a	84%
	2011	174,183	n/a	164,913	n/a	n/a	106%
	2012	175,729	n/a	73,865	n/a	n/a	238%
	2013	83,719	n/a		n/a		
	AVG.				n/a	n/a	116%
FRL[1] (Fraser Late)	1999	144,316	82,650	189,400	175%	44%	76%
	2000	187,970	220,400	195,542	85%	113%	96%
	2001	141,745	131,800	141,196	108%	93%	100%
	2002	132,946	160,100	165,245	83%	97%	80%
	2003	127,144	114,780	313,929	111%	37%	41%
	2004	104,597	97,227	196,396	108%	50%	53%
	2005	121,315	108,061	124,704	112%	87%	97%
	2006	115,489	116,682	108,639	99%	107%	106%
	2007	122,402	107,311	105,385	114%	102%	116%
	2008	125,100	116,038	88,012	108%	132%	142%
	2009	119,892	91,391	87,365	131%	105%	137%
	2010	119,953	118,891	201,334	101%	59%	60%
	2011	353,646	284,604	178,224	124%	160%	198%
	2012	107,738	93,652	69,530	115%	135%	155%
	2013	70,178	73,584		95%		
	AVG.				111%	94%	104%
NKS[1] (Nooksack Spring)	1999	1,068	n/a	n/a	n/a	n/a	n/a
	2000	834	n/a	n/a	n/a	n/a	n/a
	2001	982	n/a	n/a	n/a	n/a	n/a
	2002	1,216	n/a	n/a	n/a	n/a	n/a
	2003	1,301	n/a	n/a	n/a	n/a	n/a
	2004	1,708	n/a	n/a	n/a	n/a	n/a
	2005	1,549	n/a	330	n/a	n/a	469%
	2006	583	677	630	86%	107%	93%
	2007	582	575	334	101%	172%	174%
	2008	371	378	351	98%	108%	106%
	2009	336	315	291	107%	108%	115%
	2010	374	390	390	96%	100%	96%
	2011	340	309	309	110%	100%	110%
	2012	271	243	1,236	112%	20%	22%
	2013	1,331	n/a		na		
	AVG.				101%	102%	148%

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Appendix J. Page 4 of 9.

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
NKF[2] (Nooksack/ Samish Fall Fingerling)	1999	27,472	27,000	27,000	102%	100%	102%
	2000	21,277	19,000	24,000	112%	79%	89%
	2001	33,974	36,450	36,450	93%	100%	93%
	2002	50,361	54,420	53,310	93%	102%	94%
	2003	48,259	45,750	45,750	105%	100%	105%
	2004	37,980	34,200	17,803	111%	192%	213%
	2005	19,808	19,523	14,841	101%	132%	133%
	2006	16,795	16,899	30,591	99%	55%	55%
	2007	22,086	18,834	23,485	117%	80%	94%
	2008	34,392	35,271	28,969	98%	122%	119%
	2009	26,072	23,014	21,548	113%	107%	121%
	2010	32,061	32,627	32,627	98%	100%	98%
	2011	39,144	37,902	37,975	81%	100%	103%
	2012	45,719	43,973	41,832	104%	105%	109%
	2013	50,065	48,257		104%		
	AVG.				102%	105%	109%
SNO[2] (Snohomish Wild)	1999	5,823	5,600	5,600	104%	100%	104%
	2000	5,997	6,000	6,000	100%	100%	100%
	2001	5,876	5,760	5,760	102%	100%	102%
	2002	6,524	6,700	7,245	97%	92%	90%
	2003	6,033	5,450	5,450	111%	100%	111%
	2004	12,845	15,700	10,830	82%	145%	119%
	2005	10,161	n/a	4,612	n/a	n/a	220%
	2006	7,824	8,729	8,438	90%	103%	93%
	2007	11,153	12,289	4,005	91%	307%	278%
	2008	6,103	6,541	8,490	93%	77%	72%
	2009	8,503	8,410	2,391	101%	352%	356%
	2010	8,050	9,858	9,858	82%	100%	82%
	2011	8,281	7,600	1,192	109%	638%	695%
	2012	2,506	2,775	5,355	90%	52%	47%
	2013	3,835	3,161		121%		
	AVG.				98%	174%	176%
SKG[2] (Skagit Summer/ Fall Wild)	1999	9,107	7,600	7,600	120%	100%	120%
	2000	6,988	7,300	16,843	96%	43%	41%
	2001	9,064	9,183	14,005	99%	66%	65%
	2002	12,635	13,455	19,807	94%	68%	64%
	2003	11,906	11,348	11,348	105%	100%	105%
	2004	18,761	20,359	21,757	92%	94%	86%
	2005	16,220	19,493	21,555	83%	90%	75%
	2006	22,402	21,811	21,246	103%	103%	105%
	2007	12,324	14,252	12,868	86%	111%	96%
	2008	18,598	18,302	14,035	102%	130%	133%
	2009	22,193	20,400	10,989	109%	186%	202%
	2010	9,894	11,853	7,926	83%	150%	125%
	2011	12,556	13,044	8,382	96%	156%	150%
	2012	10,020	8,337	8,337	120%	100%	120%
	2013	7,287	13,018		56%		
	AVG.				96%	107%	106%

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Appendix J. Page 5 of 9.

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
PSN[2] (Puget Sound Natural)	1999	28,800	28,400	28,400	101%	100%	101%
	2000	15,364	10,000	20,050	154%	50%	77%
	2001	19,938	18,900	18,900	105%	100%	105%
	2002	20,008	19,801	21,477	101%	92%	93%
	2003	25,743	26,600	26,600	97%	100%	97%
	2004	24,616	23,200	33,333	106%	70%	74%
	2005	22,208	17,715	13,394	125%	132%	166%
	2006	20,182	21,801	23,555	95%	90%	86%
	2007	18,964	17,014	22,670	111%	75%	84%
	2008	23,118	21,100	23,193	110%	91%	100%
	2009	24,698	23,073	8,305	107%	278%	297%
	2010	14,734	15,128	19,491	97%	78%	76%
	2011	18,115	15,997	11,659	113%	137%	155%
	2012	14,396	13,860	17,594	104%	79%	82%
	2013	12,079	8,767		138%		
	AVG.				111%	105%	114%
STL[1] (Stillaguamish Summer/Fall Wild)	1999	1,332	n/a	1,098	n/a	n/a	121%
	2000	1,370	1,500	1,457	91%	91%	94%
	2001	1,328	1,360	1,360	98%	98%	98%
	2002	1,372	1,449	1,588	95%	91%	86%
	2003	1,860	2,050	2,050	91%	207%	91%
	2004	1,795	n/a	1,506	n/a	n/a	119%
	2005	1,377	n/a	963	n/a	n/a	143%
	2006	1,113	1,169	1,254	95%	92%	89%
	2007	1,424	1,510	785	94%	192%	181%
	2008	689	637	1,800	108%	35%	38%
	2009	1,268	1,086	1,001	117%	108%	127%
	2010	898	817	817	110%	100%	110%
	2011	812	783	1,017	104%	77%	80%
	2012	569	395	1,534	144%	26%	37%
	2013	1,393	1,328		105%		
	AVG.				104%	102%	101%
PSF+PSY[2] (Puget Sound Fingerling + Yearling)	1999	66,876	69,285	97,685	97%	71%	68%
	2000	67,306	69,800	125,850	96%	55%	53%
	2001	102,899	105,955	124,855	97%	85%	82%
	2002	114,889	124,608	92,234	92%	135%	125%
	2003	114,275	133,850	160,450	85%	83%	71%
	2004	127,902	132,300	130,922	97%	101%	98%
	2005	104,084	110,542	114,814	94%	96%	91%
	2006	107,292	113,486	141,591	95%	80%	76%
	2007	127,115	135,714	201,012	94%	68%	63%
	2008	166,071	159,200	161,118	104%	99%	103%
	2009	138,299	133,187	121,132	104%	110%	114%
	2010	138,238	140,074	181,842	99%	77%	76%
	2011	172,415	168,642	142,763	102%	118%	121%
	2012	153,462	153,989	195,888	100%	79%	78%
	2013	189,645	184,783		103%		
	AVG.				97%	90%	87%

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Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
WCN[2] (Washington Coastal Natural)	1999	42,129	43,780	27,945	96%	175%	151%
	2000	34,741	n/a	27,290	n/a	n/a	127%
	2001	34,563	35,306	27,978	98%	99%	124%
	2002	33,902	33,489	33,489	101%	90%	101%
	2003	32,785	n/a	25,479	n/a	n/a	129%
	2004	28,185	n/a	29,715	n/a	n/a	95%
	2005	34,857	n/a	37,255	n/a	n/a	94%
	2006	43,866	n/a	34,150	n/a	n/a	128%
	2007	35,695	32,362	36,499	110%	89%	98%
	2008	32,187	26,923	39,246	120%	69%	82%
	2009	35,485	31,318	38,616	113%	81%	92%
	2010	39,215	n/a	31,783	n/a	n/a	123%
	2011	32,205	n/a	43,925	n/a	n/a	73%
	2012	45,153	41,500	27,812	n/a	n/a	162%
	2013	35,464	34,023		n/a		
	AVG.				106%	100%	113%
WCH[2] (Washington Coastal Hatchery)	1999	35,239	42,752	8,964	82%	292%	393%
	2000	16,244	0	14,447	n/a	n/a	112%
	2001	15,792	0	22,859	n/a	n/a	69%
	2002	23,678	0	21,351	n/a	n/a	111%
	2003	20,755	18,222	25,812	114%	44%	80%
	2004	28,900	0	24,406	n/a	n/a	118%
	2005	28,626	0	32,421	n/a	n/a	88%
	2006	36,950	0	38,633	n/a	n/a	96%
	2007	41,801	40,497	35,880	103%	113%	117%
	2008	34,841	31,251	36,568	111%	85%	95%
	2009	41,756	42,595	36,908	98%	115%	113%
	2010	38,347	0	35,638	n/a	n/a	108%
	2011	38,208	0	38,810	n/a	n/a	98%
	2012	45,128	44,300	43,545	n/a	n/a	104%
	2013	33,629	25,304		n/a		
	AVG.				102%	130%	122%
CWS[2] (Cowlitz Spring)	1999	3,363	3,950	4,296	85%	92%	78%
	2000	4,597	6,050	5,598	76%	108%	82%
	2001	3,891	4,849	5,508	80%	88%	71%
	2002	5,126	6,800	9,910	75%	69%	52%
	2003	8,821	11,700	22,691	75%	52%	39%
	2004	18,106	27,350	32,344	66%	85%	56%
	2005	16,291	24,850	15,700	66%	158%	104%
	2006	10,699	15,250	20,081	70%	76%	53%
	2007	8,946	10,600	11,959	84%	89%	75%
	2008	8,185	12,400	6,741	66%	184%	121%
	2009	5,122	14,400	7,183	36%	200%	71%
	2010	14,459	19,409	12,410	74%	156%	117%
	2011	8,427	10,602	6,264	79%	169%	135%
	2012	7,733	8,724	11,627	89%	75%	67%
	2013	9,348	7,727		121%		
	AVG.				76%	114%	80%

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Appendix J. Page 7 of 9.

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
WSH[2] (Willamette Spring)	1999	46,187	49,875	55,801	93%	89%	83%
	2000	57,202	61,211	55,900	93%	110%	102%
	2001	59,207	59,600	84,000	99%	71%	70%
	2002	73,151	77,434	127,200	94%	61%	58%
	2003	108,530	112,521	129,700	96%	87%	84%
	2004	113,708	112,701	112,701	101%	100%	101%
	2005	105,111	122,280	59,500	86%	206%	177%
	2006	48,880	52,388	52,388	93%	100%	93%
	2007	44,542	61,071	44,509	73%	137%	100%
	2008	20,185	40,851	40,050	49%	102%	50%
	2009	44,161	41,205	38,110	107%	108%	116%
	2010	70,960	66,360	119,114	107%	56%	60%
	2011	117,375	109,600	84,603	107%	130%	139%
	2012	105,098	88,202	70,153	119%	126%	150%
	2013	58,436	65,982		89%		
	AVG.				94%	106%	99%
SUM[2] (Columbia River Summer)	1999	21,651	20,900	22,276	104%	94%	97%
	2000	27,214	28,038	30,700	97%	91%	89%
	2001	27,029	24,500	54,521	110%	45%	50%
	2002	70,290	77,700	129,000	90%	60%	54%
	2003	97,280	87,600	83,084	111%	105%	117%
	2004	83,246	78,569	65,446	106%	120%	127%
	2005	66,190	62,400	60,060	106%	104%	110%
	2006	75,848	78,512	78,196	97%	100%	97%
	2007	56,948	45,555	37,200	125%	122%	153%
	2008	50,171	52,000	55,500	96%	94%	90%
	2009	68,114	70,700	53,878	96%	131%	126%
	2010	81,403	88,800	72,364	92%	123%	112%
	2011	89,000	91,900	80,574	97%	114%	110%
	2012	91,202	91,200	58,300	100%	156%	156%
	2013	72,042	73,500		98%		
	AVG.				102%	104%	106%
BON+CWF[2] (Bonneville + Cowlitz Hatcheries)	1999	26,651	34,800	37,300	77%	93%	71%
	2000	17,095	23,700	27,000	72%	88%	63%
	2001	28,732	32,200	94,200	89%	34%	31%
	2002	100,401	137,600	156,400	73%	88%	64%
	2003	100,196	115,900	154,983	86%	75%	65%
	2004	64,696	77,100	108,300	84%	71%	60%
	2005	65,971	74,100	77,799	89%	95%	85%
	2006	49,173	55,800	58,317	88%	96%	84%
	2007	49,219	54,900	32,689	90%	168%	151%
	2008	58,557	59,000	60,268	99%	98%	97%
	2009	91,519	88,800	76,738	103%	116%	119%
	2010	95,581	90,600	103,055	105%	88%	93%
	2011	139,873	133,430	108,961	105%	122%	128%
	2012	132,629	126,999	84,798	104%	150%	156%
	2013	86,456	94,600		91%		
	AVG.				90%	99%	91%

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Appendix J. Page 8 of 9.

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
SPR[1] (Spring Creek Hatchery)	1999	62,831	65,800	49,200	95%	134%	128%
	2000	17,335	21,900	20,100	79%	109%	86%
	2001	56,089	56,600	125,000	99%	45%	45%
	2002	153,070	144,400	160,900	106%	90%	95%
	2003	89,116	96,900	180,600	92%	54%	49%
	2004	124,820	138,000	175,300	90%	79%	71%
	2005	92,021	114,100	93,145	81%	122%	99%
	2006	43,421	50,000	27,918	87%	179%	156%
	2007	19,421	21,800	14,583	89%	149%	133%
	2008	87,109	87,200	79,433	100%	110%	110%
	2009	46,652	59,300	48,970	79%	121%	95%
	2010	167,251	169,000	130,768	99%	129%	128%
	2011	105,900	116,400	70,577	91%	165%	150%
	2012	72,135	63,800	56,766	113%	112%	127%
	2013	36,276	38,000		95%		
	AVG.				93%	114%	105%
URB[2] (Columbia Upriver Bright)	1999	173,866	147,500	166,700	118%	88%	104%
	2000	212,317	171,100	155,900	124%	110%	136%
	2001	150,973	127,200	232,500	119%	55%	65%
	2002	249,721	281,000	276,900	89%	101%	90%
	2003	246,890	280,400	373,200	88%	75%	66%
	2004	246,943	292,200	367,900	85%	79%	67%
	2005	318,535	352,200	268,744	90%	131%	119%
	2006	231,319	253,900	227,535	91%	112%	102%
	2007	168,594	182,400	114,491	92%	159%	147%
	2008	151,839	162,500	196,881	93%	83%	77%
	2009	259,415	259,900	212,047	100%	123%	122%
	2010	296,816	310,800	324,908	96%	96%	91%
	2011	388,138	398,200	322,234	97%	124%	120%
	2012	365,693	353,500	294,947	103%	120%	124%
	2013	437,422	432,500		101%		
	AVG.				99%	104%	102%
LYF[1] (Snake River Wild)	1999	542	n/a	1,631	n/a	n/a	33%
	2000	1,243	n/a	900	n/a	n/a	138%
	2001	733	734	2,652	100%	14%	28%
	2002	2,066	n/a	2,185	n/a	n/a	95%
	2003	2,493	2,185	3,895	114%	56%	64%
	2004	4,323	3,725	4,000	116%	93%	108%
	2005	4,453	4,000	3,454	111%	116%	129%
	2006	8,285	3,500	2,743	237%	128%	302%
	2007	3,128	2,700	2,016	116%	134%	155%
	2008	2,718	2,534	1,598	107%	159%	170%
	2009	5,743	6,952	1,430	83%	486%	402%
	2010	2,609	2,610	9,583	100%	27%	27%
	2011	9,199	8,006	9,215	115%	87%	100%
	2012	10,401	8,683	11,115	120%	78%	94%
	2013	15,154	14,900		102%		
	AVG.				118%	125%	132%

-continued-

Stock	Year	Model Forecast	Agency Forecast	Postseason Return	Model Fcst/ Agency Fcst	Agency Fcst/ Postseason	Model Fcst/ Postseason
MCB[2] (Mid-Columbia Bright)	1999	37,997	38,300	50,100	99%	76%	76%
	2000	53,460	50,600	36,800	106%	138%	145%
	2001	45,055	43,500	66,400	104%	66%	68%
	2002	102,085	96,200	108,300	106%	89%	94%
	2003	126,698	104,800	150,300	121%	70%	84%
	2004	94,895	90,400	117,600	105%	77%	81%
	2005	93,837	89,400	97,900	105%	91%	96%
	2006	90,780	88,300	80,471	103%	110%	113%
	2007	77,470	68,000	47,106	114%	144%	164%
	2008	59,481	54,000	75,489	110%	72%	79%
	2009	99,685	94,400	73,069	106%	129%	136%
	2010	82,454	72,600	78,937	114%	92%	104%
	2011	108,005	100,000	87,263	108%	115%	124%
	2012	100,809	90,800	61,850	111%	147%	163%
	2013	113,333	105,200		108%		
	AVG.				108%	101%	109%
LRW[2] (Lewis River Wild)	1999	3,072	2,600	3,400	118%	76%	90%
	2000	4,053	3,500	10,200	116%	34%	40%
	2001	16,574	16,700	15,700	99%	106%	106%
	2002	18,910	18,200	24,900	104%	73%	76%
	2003	25,820	24,600	25,900	105%	95%	100%
	2004	24,590	24,100	21,200	102%	114%	116%
	2005	21,937	20,200	16,767	109%	120%	131%
	2006	19,818	16,600	17,896	119%	93%	111%
	2007	10,306	10,100	4,276	102%	236%	241%
	2008	4,479	3,800	7,120	118%	53%	63%
	2009	9,363	8,500	7,533	110%	113%	124%
	2010	11,034	9,700	10,862	114%	89%	102%
	2011	13,429	12,500	15,180	107%	82%	88%
	2012	17,806	16,200	13,926	110%	116%	128%
	2013	16,713	14,200		118%		
	AVG.				110%	100%	108%
ORC[1] (Oregon Coastal)	1999	65,338	72,084	66,039	91%	109%	99%
	2000	61,457	63,259	52,889	97%	120%	116%
	2001	58,062	66,412	100,548	87%	66%	58%
	2002	73,055	73,914	149,649	99%	49%	49%
	2003	101,310	85,483	145,302	119%	59%	70%
	2004	135,716	131,904	129,579	103%	102%	105%
	2005	133,886	167,213	167,211	80%	100%	80%
	2006	125,550	136,373	112,797	92%	121%	111%
	2007	108,338	131,195	47,011	83%	279%	230%
	2008	53,417	70,101	39,615	76%	177%	135%
	2009	32,254	48,072	41,800	67%	115%	77%
	2010	51,234	59,806	64,799	86%	92%	79%
	2011	73,043	78,199	87,646	93%	89%	83%
	2012	82,789	80,749	87,540	103%	92%	95%
	2013	70,385	80,095		88%		
	AVG.				91%	112%	99%

Note: n/a = not available.

Note: Model and agency forecast and postseason return are from the first postseason run for the separate yearly calibrations.

[1] Escapement.

[2] Terminal Run.

APPENDIX K: ISSUES WITH ERA AND MODEL CALIBRATION

Issues with CWT data

- **Alaska Spring:** As in previous years, the rack return, cost-recovery, personal use and stray recoveries for AKS were imported as auxiliary data.
- **Chilkat, Unuk and Taku Spring:** The escapement and stray recoveries for CHK, UNU and TAK were imported as auxiliary data.

Changes to the input data for the Chinook Model calibration

- **Chinook nonretention file**

  SEAK net: SEAK gillnet harvest from 2005 to 2012 is no longer stratified into large (>28 inches total length) and nonlarge (<28 inches total length) in the Alaska Department of Fish and Game fish ticket database. The treaty only applies to large Chinook salmon, so the total gillnet harvest from 2005 to 2012 was stratified into large and nonlarge categories using age-sex-length data when available and CWT data when age-sex-length data was not available. The SEAK gillnet treaty harvest reflects these changes.

Table K1. List of calibrations and associated input changes considered during the 2013 preseason calibration process.

CLB No.	Conditions	Comments
1301	5-year average EVs	same assumptions as 2012 pre-season.
	long-term average mat rates	
	no WCVI forecast	
1302	1-year average EVs	
	5-year average mat rates	
	no WCVI forecast	
	no FRL forecast	
1303	2-year average EVs	
	else same as 1302	
1304	WCVI forecast	
	else same as 1302	
1305	Long-term average mat rates	this configuration is analogous to how calib 12...was run and will be used for post-season assessment; contains possible discrepancies in cnr file; will necessitate another set of calib runs
	5-year average EVs	
	No WCVI Forecast	
	FRL Forecast	
1306	5-year average mat rates	contains possible discrepancies in cnr file; will necessitate another set of calib runs
	1-year average EVs	
	No WCVI Forecast	
	FRL Forecast	
1307	Long-term average mat rates	this configuration is analogous to how calib 12...was run and will be used for post-season assessment; cnr discrepancies resolved
	5-year average EVs	
	No WCVI Forecast	
	FRL Forecast	
1308	5-year average mat rates	this configuration is how our pre-season AI is chosen; cnr discrepancies resolved
	1-year average EVs	
	No WCVI Forecast	
	FRL Forecast	
1309	Long-term mat rates	
	5-year average EVs	
	no WCVI forecast	
	FRL Forecast	
1310	5-year average mat rates	
	1-year average EVs	
	Bias-corrected WCVI (6-year series)	
	FRL Forecast	
1311	Long-term average mat rates	
	5-year average EVs	
	Bias-corrected WCVI (6-year series)	
	FRL Forecast	

APPENDIX L: PROGRESS REPORTS FOR INDIVIDUAL PROJECTS FUNDED IN 2012 UNDER THE CODED WIRE TAG IMPROVEMENT PROGRAM

2012 Canada Project Reporting

The Canadian projects summarized in nine categories were funded in FY 2012 (Table L1) for a total expenditure of $1,500,000. Below the table are summaries for each individual project, including a description of the project, deliverable benefits to the CWT system, and the particular issue identified in PSC Technical Report 25 (PSC 2008).

Table L1. Canadian CWT Project Expenditures for 2012–2013, approved in February, 2012.

Project Category	TR25 Issue	Project Title	Cost
Increased CWT marking of Canadian indicators	2	Incremental tagging of 12 Indicator Stocks (Robertson Creek, Cowichan, Big Qualicum, Quinsam, Lower Shuswap, Nicola, Chilliwack, Harrison, Taku, Stikine, Kitsumkalum, and Atnarko)[1]	$358,500
Increased deadpitch CWT recovery effort, all Indicators	5	Increased effort in CWT recovery in indicator escapement programs (Quinsam, Cowichan, Big Qualicum, Chilliwack, Harrison, and Nicola)[1]	$80,500
Uncertainty in estimates of escapement or terminal fishery catch	1, 6	Atnarko Chinook CWT Indicator Stock[1]	$110,000
Agency staffing (Programmer, Catch QA/QC Analyst, CWT Recovery Coordinator)	4, 7, 8, 9, 10, 11, 14, 15, 17, 18	Regional CWT Data system Programming, Regional CWT and Catch Estimation QA/QC, and Regional Sport and First Nations Fishery CWT Recovery Coordination[1]	$250,000
Increased head recovery costs	2, 4, 5, 7	CWT Head Lab Processing and Data Management[1]	$70,000
Low sample rates in terminal fisheries, sport, and First Nations CWT recovery improvements	4, 7, 9, 10, 11	Regional Commercial, Sport, and First Nations Fishery CWT Recovery Improvements[1]	$215,000
Low sample rates in terminal fisheries, First Nations fishery CWT recovery improvements	4, 10	Improvements in CWT Recovery in Terminal First Nations Fisheries (Fraser River, Strait of Georgia, WCVI, Bella Coola, and Cowichan)[1]	$80,000
Low sample rates in terminal fisheries, First Nations fishery CWT recovery improvements	4, 10	Improvements in Catch Estimates and CWT Recovery in Terminal Recreational Fisheries	$174,000
CWT data reporting system improvement	13, 15, 17	Database Improvements	$162,000
		Canada Total	**$1,500,000**

[1] Multiyear.

Project Title: Increased CWT Marking of Chinook Indicators

Agency: DFO

Approved funding for this cycle: $263,500

Total CWTIT funding approved to date: $1,132,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 2 (Determination of tagging levels)

Project Description, Accomplishments, Results and Deliverables: This project involved increasing CWT application and release levels on 9 Chinook indicator stocks in British Columbia. Tagging levels were set based on recent survival and fishery sampling rates in order to achieve stated precision objectives in the estimation of fishery-specific exploitation rates. The indicator stocks that received increased tagging through this project were: Robertson Creek, Cowichan River, Big Qualicum River, Quinsam River, Chilliwack River, Harrison River, Nicola River, Lower Shuswap River, and Atnarko River.

Increased tagging was initiated on selected stocks prior to brood year 2009 (e.g., Quinsam) through other external funding sources, but comprehensive increases in tagging levels began across these stocks in brood year 2009. To date, CWT release targets have been met for these stocks in all brood years, save for the Cowichan River in brood years 2009 and 2010 when poor escapements prevented collection of adequate broodstock for full release targets. Infrastructure improvements at DFO hatcheries that were funded through the first year of the Coded Wire Tag Improvement Program (CWTIP) continue to allow expanded tagging to be completed on an annual basis. Returns of marked 3-year-old adult Chinook to Salmonid Enhancement Program (SEP) hatcheries in 2012 from the first year of expanded tagging were strong, indicating that increased CWT recoveries are likely to be observed in future years as the fish released from the expanded marking mature and enter the various fishery and escapement strata.

This project can be considered to have been successful to date. Continued funding will be required to maintain current marking levels, otherwise marking will likely return to pre-2009 levels.

Continued CWTIT Funding Needed: Yes.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWTIP include increased CWT recoveries in all fishery and escapement strata for the 9 Chinook indicator stocks, which will allow for increased precision in the estimation of exploitation rates in the various fishery strata.

Project Title: Stikine River Chinook CWT Application and Tag Recovery

Project agency: DFO, Marc Labelle and Peter Etherton

Approved funding for this cycle: $30,000

Total CWTIT Funding approved to date: $120,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 2 (Determination of tagging levels)

Project Description, Accomplishments, Results and Deliverables: The project was designed to increase the CWT level of Stikine River Chinook salmon smolts. Approximately 35,000 additional wild Stikine Chinook smolts (including the Little Tahltan stock grouping) were tagged annually. In addition approximately 2% were measured for weight and length. This project can be considered to have been

successful to date.

Continued CWTIT Funding Needed: Yes. Continued funding will be required to maintain current marking levels, otherwise marking will likely return to pre-2009 levels.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Tagging rates could not have been achieved without this funding source. Approximately 80% of the fishery catch in the Stikine River were sampled for CWTs and heads sent to J. L. Thomas Labs, Inc. for analysis. Loss of this funding would compromise Pacific Salmon Treaty commitments to monitor fishery impacts, i.e., fewer CWTs in U.S. fisheries for exploitation rate analysis, and lack of information to evaluate/refine Chinook escapement goal. In the absence of this funding, some baseline biological data (e.g., age, gender, size) could be collected from the fishery catches. However, the resulting small sample size would result in low precision after CWT expansion.

Project Title: Taku Chinook Fishery Monitoring and CWT Application

Project agency: DFO, Marc Labelle and Ian Boyce

Approved funding for this cycle: $30,000

Total CWTIT Funding approved to date: $120,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 2 (Determination of tagging levels)

Project Description, Accomplishments, Results and Deliverables: Application of CWTs to wild outmigrating Taku River juveniles for use in monitoring of directed Chinook fisheries was established in 2005. 8,000 additional wild Taku Chinook smolts were tagged as a result of this funding. This project can be considered to have been successful to date.

Continued CWTIT Funding Needed: Yes. Continued funding will be required to maintain current marking levels, otherwise marking will likely return to pre-2009 levels.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Tagging could not have been achieved without this funding source. Prior to tagging, Taku fisheries were not sampled. During this program 20–70% sampling rates have been achieved.

Loss of this funding would compromise Pacific Salmon Treaty commitments to monitor fishery impacts (i.e., fewer CWTs in U.S. fisheries for determining exploitation rates), and compromise information to evaluate and refine Chinook escapement goal.

Project Title: Atnarko Chinook CWT Indicator Program: Uncertainty in estimates of escapement and terminal CWT catch

Agency: DFO

Approved funding for this cycle: $130,000

Total CWTIT funding approved to date: $346,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Representation of production regions), Issue 4 (Low sample rates in terminal fisheries), Issue 6 (Uncertainties in estimates of escapement or catch), Issue 10 (Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables: This project began in 2009 with the objective to expand the Atnarko assessment program to a Central Coast Chinook indicator stock (noted as lacking in Technical Report 25). The only northern indicator, Kitsumkalum, is a stream-type stock; Atnarko is an ocean-type stock. Progress included application of 250,000 incremental CWTs, sampling of the terminal commercial, sport, and First Nations fisheries, and reintroduction of a mark–recapture program to improve escapement estimates and CWT recoveries. This project has been successful in improving the sample rates and precision in the estimation of CWTs in escapement and terminal catch.

Is continuing funding required? Yes. Without continued funding, ongoing maintenance of the terminal mark–recapture program to estimate spawning escapement, terminal fishery sampling and increased CWT application will not be possible. Increased numbers of CWTs applied since 2009 may not be recovered in terminal fisheries and escapement without intensive sampling programs.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: The 2009 escapement mark–recapture program included application of 925 tags, 2,630 carcasses examined, and 24% of tags recovered, which provided a spawning estimate of 10,700 Chinook (CV 5.7%). The commercial fishery sampling rates ranged from 34–72% (and 110 CWTs recovered) with the exception that catch in the first week of July was not sampled. The Bella Coola First Nations fishery was sampled at 25% and 57 CWTs were recovered.

The 2010 escapement mark–recapture program was impacted by a major flood event at the end of September. Prior to the flooding event, 1,008 Chinook were tagged, 1,025 carcasses examined, and 87 tags recovered. The preliminary escapement estimate using the standard was 10,900–11,760 (CV 10–11%). The Bella Coola River First Nation fishery caught 3,200 fish (preliminary), 775 were examined for fin clips, and 76 heads collected for CWT dissection.

The 2011 escapement mark–recapture program was successfully implemented; 833 Chinook were tagged, 775 carcasses examined, and 68 tags recovered, providing a preliminary escapement estimate of 9,105 (CV 14%). In 2011 all terminal fisheries were monitored. More than 30% of the First Nations food, social, and ceremonial (FSC) fishery was sampled and 47 CWTs recovered. The commercial gillnet fishery caught 4,600 Chinook and the Bella Coola sport fishery caught less than 200 Chinook due to flow conditions.

The 2012 escapement mark–recapture program was successfully implemented; 644 Chinook were tagged, 1,097 carcasses examined, and 65 tags recovered, providing a preliminary escapement estimate of 10,389 (CV 12%). 98 CWTs were observed in the spawning escapement. In 2012 terminal FSC and commercial fisheries were monitored. Greater than 40% of the First Nations FSC fishery was sampled and 147 CWTs recovered. The commercial gillnet fishery caught 3,300 Chinook; CWT results are still pending.

Project Title: Salmonid Enhancement Program CWT Head Data Coordinator/Archival CWT Database Review

Agency: DFO

Approved funding for this cycle: $67,000

Total CWTIT funding approved to date: $67,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 10 (Intra-agency coordination), Issue 13 (Timeliness of reporting), Issue 15 (Uncertainty in catch estimates and CWT expansions, data management)

Project Description, Accomplishments, Results and Deliverables: This project funded the staffing of a term biologist position in the DFO Regional Salmonid Enhancement Program (SEP) sector for 10 months in 2012/2013. Two main objectives are listed below.

1. Develop a formal set of Best Practices for the collection, transfer, and management of CWT heads and data at all escapement projects. This includes serving as a Regional Head Data Coordinator for all escapement programs on an inseason basis.
2. Review archival escapement data from DFO enhancement programs to ensure standardized analytical techniques and data verification procedures have been employed.

Through the Regional Head Data coordinator role, this project served to provide a single point of contact to lead the annual program to collect CWT heads and deliver them to the dissection lab in a timely manner. In the course of this role, a thorough review of the current data and head transfer program was conducted, efficiencies were identified, and a complete set of Best Practices are being developed with the goal of improving data quality and delivery time, reducing costs at the dissection lab, and streamlining operations for current DFO staff.

The archival data review component of this project involves a systematic review of historic and recent SEP escapement data, including hard copy CWT sampling records, tag decoding, and stratum abundance estimates. As part of the implementation of a new SEP data management system in recent years, ongoing review of archival data has identified inconsistencies with the current database records that require reconciliation. This project has systematically begun a review of archival hard copy CWT sampling records, updating existing databases with retrieved CWT and stratum abundance estimate data as it has been located and/or corrected. As data updates are made to the new SEP Enhancement Planning and Escapement Database (EPAD), database updates will then be transferred to the CTC CWT database as part of the annual data upload. To date, there have been significant improvements made in the quality of the data that is provided annually for international and domestic data sharing, with future updates expected as this project continues. To date, significant progress has been made on both key objectives in this project.

Continued CWTIT Funding Needed: Yes. It is anticipated that the CWT Head Data Coordinator project will be completed successfully over the next few months. It is also anticipated that the historic CWT data review project will continue to make progress, although it was recognized at the beginning of this project that review of all CTC indicator data would not likely be completed in one year.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Improvements in reporting of CWT data from escapement projects will directly benefit the CWT program and CTC by ensuring the current return year escapement data are available in time for annual CTC CWT analysis. In

addition improvements made in the delivery and CWT dissection system will serve to reduce future costs for processing of escapement heads. These savings will help to offset pressures from increased CWT recoveries expected as an outcome of the CWTIP, and will provide lasting improvements in the quality and timeliness of CWT reporting.

Project Title: Regional CWT Data System Programming

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $90,000

Total CWTIT funding approved to date: $350,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of reporting), Issue 14 (Incomplete/no exchange of CWT data), Issue 15 (Inter/Intra agency coordination), Issue 17 (Updating CWT data difficulties), Issue 18 (Inadequate CWT validation)

Project Description, Accomplishments, Results and Deliverables: This project involves hiring a programmer/analyst to provide systems analysis, design and programming support to DFO CWT program system—the Mark Recovery Program (MRP). The objectives for this year's funding are to continue ongoing system improvements and new development including the items listed below.

1. Improve data through improvements to validation, corrections to data, and corrections to historical algorithms.
2. Improve data management through new data entry interfaces to central database.
3. Improve access to information for DFO users and exports to the Regional Mark Information Centre.
4. Improve interfaces with DFO hatcheries system, catch monitoring system, and escapement systems.
5. Implement modifications for new data sources from other CWTIT projects.

Continued Funding Needed: Yes, DFO has made significant progress but ongoing funding in 2012 and future years is requested in support of the above objectives. Additional programming support is still required to improve data management and automation for all CWT dissection activities, and for data management of First Nations fisheries and escapement sampling.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This is the fourth year of funding to support improvements to the MRP system. Prior to CWTIP funding, DFO had a significant backlog of programming issues and was not able to meet the bilateral reporting requirements effectively as the MRP system was a legacy fortran system. With this additional resource, DFO has made significant progress in reviewing and converting the legacy system using current technology and in developing new interfaces to improve access to the information within DFO. This has allowed DFO to meet bilateral exchange deadlines and to make modifications that have been necessary or will be required in the future.

Project Title: Regional Sport and First Nations Fishery CWT Recovery Coordination

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $85,000

Total CWTIT funding approved to date: $326,400

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Low sample rates in terminal fisheries), Issue 7 (Low sample rates in highly mixed stock fisheries), Issue 9 (Nonrepresentative sampling), Issue 10 (Incomplete coverage of fisheries or escapement), Issue 11 (Voluntary sport fishery sampling programs)

Project Description, Accomplishments, Results and Deliverables: This project involves hiring a senior fisheries technician to implement fisheries sampling improvements within the DFO recreational and First Nations fisheries. Objectives are listed below.

1. Develop protocols and implement sampling programs to adequately represent First Nations fisheries.
2. Develop and implement program improvements to Increase participation in the recreational voluntary sport recovery program to increase sample rates representatively.
3. Provide technical support, including design, review, implementation, and QA/QC for all aspects of CWT sampling within commercial, recreational, test and First Nations fisheries.
4. Promote improvements to catch monitoring and sampling participation through communications promotional material, or improvements to sampling protocols.

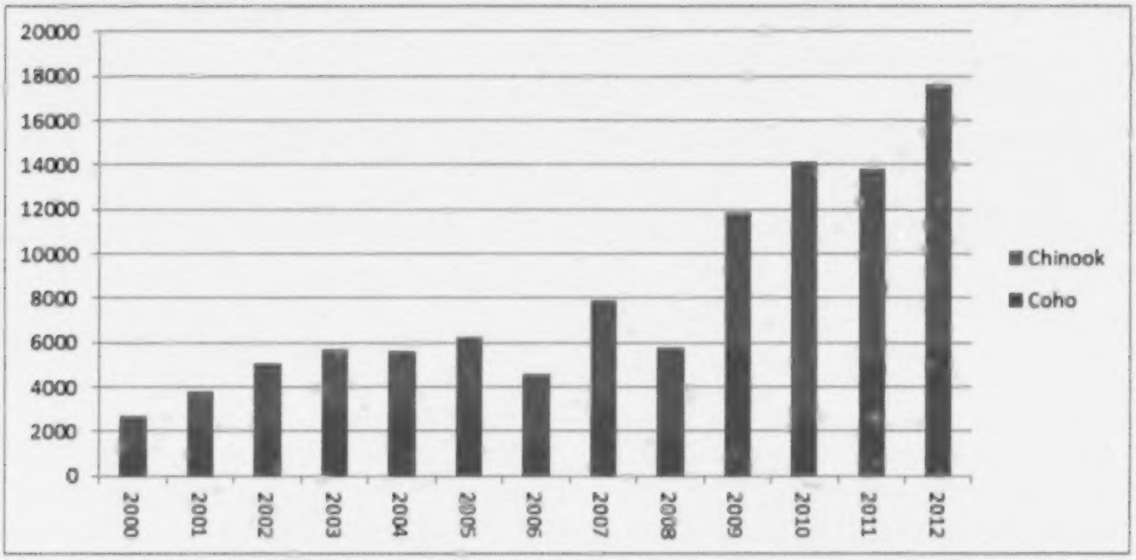
Continued Funding Needed: Yes, with the increased workload associated with the oversight and delivery of recreational and First Nations sampling programs, continued funding through 2012 and in future years is imperative to ensure that gains achieved are maintained across DFO fishery sampling programs.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This is the fourth year of funding a fisheries technician to make improvements to sampling of recreational and First Nations fisheries. With the addition of a second fisheries technician, DFO has made significant progress in improving sampling across CWT fishery sampling programs (recreational, First Nations, commercial, and test fisheries) in terminal areas and in mixed stock fisheries.

Specific achievements in First Nations fisheries include the introduction and increasing progress toward adequate sampling rates in the following locations.

- Robertson Indicator, Alberni Inlet FSC First Nations fisheries: 2012 preliminary sample rate (SR) 52%
- Cowichan Indicator, Cowichan Tribes FSC fisheries sampled: 2012 SR not yet available
- Atnarko Indicator, Nuxalk FSC: 2012 SR 46%
- WCVI Mixed Stock T'aaquiihak economic fishery: 2012 SR 54%
- Lower Fraser, FSC fishery: 2012 SR 5–10%
- BC Interior, Kamloops Lake economic fishery: 2012 SR 100%, FSC 2012 SR not yet available

Improvements in recreational fishery sampling can be generally reviewed graphically in the following figure by observing the impressive increases in the number of recreational samples since this project commenced in 2009 compared to historical results.



Project Title: Regional CWT and Catch Estimation QA/QC

Agency: DFO, Bruce Patten

Approved funding for this cycle: $75,000

Total CWTIT funding approved to date: $264,700

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch), Issue 8 (Uncertainty in estimates of catch in highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables: This project provides QA/QC of all catch data associated with CWT recoveries and ensures proper stratification for tag expansions. Checks of current (2012) season's data were maintained as the data were received. Quality assurance of previous seasons' (2007–2011) salmon logbook data has been completed. As time allows, staff will continue checking 2006 and earlier seasons. Importing of historic test fishery data has been contracted out, to be completed by mid-March 2013.

Continued CWTIT Funding Needed: Yes. Loss of these resources would result in reduced QA/QC and consequently a reduction in data quality.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This project has contributed to the accuracy of the CWT reporting system by systematically checking for, and resolving, errors.

Project Title: Improvements to Commercial Catch Databases Fishery Operations System

Agency: DFO, Bruce Patten

Approved funding for this cycle: $60,000

Total CWTIT funding approved to date: $60,700

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch), Issue 8 (Uncertainty in estimates of catch in highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables: This initiative funded a contractor to consult with the DFO Area Managers on the Salmon Post-Season Catch and Effort Estimate Finalization Policy. They also developed area-specific procedures to ensure the estimates will be finalized each year. The contractor will compile historical catch and effort data (2005 and later) and import it into the Fishery Operations System (FOS).

Continued CWTIT Funding Needed: Yes.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This project is establishing standard procedures and finalizing catch estimates in the FOS, so that final postseason catch and effort estimates are available for use by the CTC in a timely manner. Once complete, this project will contribute to the accuracy of the catch data associated with CWT recoveries and ensure proper stratification for tag expansions. Regionally, this project is very important to ensure consistent postseason catch and effort estimates are available for use by the MRP.

Project Title: Mark Recovery Program Archive Data Recovery

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $20,000

Total CWTIT funding approved to date: $20,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 13 (Timeliness of reporting), Issue 14 (Incomplete/no exchange of CWT data)

Project Description, Accomplishments, Results and Deliverables: This project involves hiring two temporary technicians to review over 40 years of archived material associated with the DFO CWT program. The objectives for the funding are listed below.

1. Create an inventory of archived material—review and classify, identify gaps in DFO CWT information system vs source documents or CWTs, and identify data recovery projects.
2. Develop a strategy for retention. Options include data recovery/data entry, digital conversion of paper forms, CWT reading and digitizing, archive with retention requirements established, redistribute to appropriate existing DFO staff, or destroy.
3. Develop estimates to perform priority data recovery, scanning of paper forms, CWT reading and digitizing for 2013 CWTIT projects.
4. Perform priority data recovery, scanning of paper forms, CWT digitizing, as determined as employment period allows.

Continued CWTIT Funding Needed: Yes. This was year one of a two-year project.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: It is expected that this project will result in identification of historical sources of data (such as recoveries from test, research, or First Nations fisheries) or fields on data records that have never been entered into the CWT system. Additionally, performing this review will result in the development of new protocols for digital management of DFO CWT program records which will improve access to data for QA/QC in the future. Finally, the reduction of archived material will eliminate future expenditures by DFO for the management of large quantities of archive material and allow for these funds to be spent on CWT program delivery.

Project Title: Regional Commercial, Sport and First Nations Fishery CWT Recovery Improvements

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $215,000

Total CWTIT funding approved to date: $585,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Low sample rates in terminal fisheries), Issue 7 (Low sample rates in highly mixed stock fisheries), Issue 9 (Nonrepresentative sampling), Issue 10 (Incomplete coverage of fisheries or escapement), Issue 11 (Voluntary sport fishery sampling programs), Issue 12 (Sampling methods to facilitate MSF evaluations)

Project Description, Accomplishments, Results and Deliverables: This project is a portfolio of many activities being directed at Canadian fisheries management to make strategic improvements to CWT sampling programs and CWT data. The focus of these projects is to provide a legacy of improvements that can be sustained in the future. Projects include the following:

1. Replace, repair and upgrade sampling infrastructure requirements such as electronic sampling equipment or sampling tables for commercial fisheries.
2. Expand equipment to facilitate increases in recreational and First Nations sampling (e.g., freezers, freezer boxes, closed containers for brine solution).
3. Develop communications strategy for participation in meetings, related events, etc., and develop and distribute communication or promotional materials.
4. Review existing sampling programs onsite and introduce QA/QC through ongoing audits.
5. Review, develop, and produce improved data collection materials (e.g., forms, labels, sample kits).
6. Introduce sampling freezer troll vessels in B.C. fisheries to improve representative sampling in this fishery.

Continued CWTIT Funding Needed: Yes. Projects have been designed to become operational and will not require ongoing funding; however, future funding at a reduced level will be required for life-cycle replacement of equipment.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This project has made improvements the quality and quantity of CWT data that is available for use in analysis across DFO fishery sectors sampling.

Project Title: CWT Head Lab Processing and Data Management

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $70,000

Total CWTIT funding approved to date: $316,400

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 2 (Determination of tagging levels), Issue 4 (Low sample rates in terminal fisheries), Issue 7 (Low sample rates in highly mixed stock fisheries), Issue 9 (Nonrepresentative sampling), Issue 10 (Incomplete coverage of fisheries or escapement), Issue 11 (Voluntary sport fishery sampling programs), Issue 12 (Sampling methods to facilitate MSF evaluations)

Project Description, Accomplishments, Results and Deliverables: This project is required to pay for increased costs to ship, dissect, and perform data entry for increased quantities of head recoveries from DFO-managed fisheries and escapement sampling programs. Increases are attributed to the implementation of other CWT improvement projects listed below.

1. Increased tag rates in fisheries as a result of bi-lateral increases to tagging (Issues 1–3)
2. Increased deadpitch CWT recovery efforts (Issue 5)
3. Increased sampling rates, in commercial, test or research fisheries (Issues 4, 7)
4. Introduction of First Nations sampling programs (issues 4, 7, 9)
5. Improvements to Voluntary Sport Head Recovery Program, resulting in increased sampling rates (Issues 4, 7, 11)
6. Introduction of sampling of freezer troll vessels in B.C. fisheries to improve representative sampling in this fishery (Issue 11)
7. Re-introduction of sampling of unmarked Chinook (double index tagged fish) to support assessment of mark selective fisheries (Issue 12)

Continued CWTIT Funding Needed: Yes. With increased head recoveries across DFO CWT recovery programs, continued funding will be required in 2012 and in future years.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This project ensures that funds and effort spent to complete other projects that increase tag recoveries of indicator stocks result in useable CWT data to support analysis.

Project Title: Chinook Test Fishery CWT and Biosample data import into Fishery Operations System

Agency: DFO, Bruce Patten

Approved funding for this cycle: $15,000

Total CWTIT funding approved to date: $41,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 10 (Incomplete coverage of fisheries)

Project Description, Accomplishments, Results and Deliverables: This project incorporates historic data for Albion and Skeena Tyee Test Fisheries into the Fishery Operations System (FOS). The Skeena Tyee Test fishery project is complete. Fishery openings, catch data and biodata have been imported back to 1955. Staff are now able to report the inseason comparison with the historic index using an automated process rather than the previous manual one, increasing efficiency and quality control. For the Albion historic data import, 2002 data are currently being imported into FOS, 1997–2001 biodata have been imported into FOS and verified, 1990–1996 data have been reformatted and are ready to import into FOS, and 1980–1989 data are being updated.

Continued CWTIT Funding Needed: Yes

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Regionally, this project enabled historical catch data associated with CWT recoveries and tag expansions to be imported and consequently available for use by the MRP, creating a more accurate time series on which to base calculations. Capturing the Albion and Skeena Tyee test fisheries data in FOS has improved the quality of CWT estimates for stocks and for the data used by the CTC for exploitation rate analysis of the Kitsumkalum, Lower Shuswap, Dome, Nicola, Chilliwack, and Harrison River indicator stocks. The data can be used to identify CWT recoveries in terminal net fisheries not previously available to the CTC. Once data are captured in FOS, it is easier to extract information, do historic analyses, and export data to the MRP program.

Project Title: Lower Fraser First Nations CWT Recovery Improvements

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $25,000

Total CWTIT funding approved to date: $80,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Low sample rates in terminal fisheries), Issue 10 (Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables: The Lower Fraser Fisheries Alliance (LFFA) is a relatively new organization formed in March 2010 which has been empowered by its 29-member First Nations to establish a First Nation to First Nation (Tier 1) working relationship to address issues of common interest and work with DFO toward resolutions for effective resource and fisheries management.

This is a collaborative project between the DFO and the LFFA to make improvements to CWT awareness and sampling in the Lower Fraser Area (LFA) through the following activities.

1. Build understanding of the CWT program and the Salmon Head Recovery Program throughout the LFA.
2. Provide technical support to LFA First Nations monitoring organizations on the collection and provision of biological samples and high quality supporting data associated with the CWT program.
3. Develop a communication plan, identifying the audience, message, strategy, form and timing of communication for First Nations in the LFA.
4. Develop communication presentations and products.
5. Provision communication, education and awareness sessions with LFA First Nations, targeted to First Nations Community leaders, fisheries managers, biologists and technical staff, and fishers.
6. Provision training to First Nations fishery monitoring programs to collect CWT biological samples and data to support and enhance existing First Nations fishery monitoring programs in the LFA.

Continued CWTIT Funding Needed: Yes. Targeted sampling and directed program discussions by LFFA and DFO staff, supplemented with monitoring training sessions and feedback on data quality, are proving to be effective in increasing submission of heads and improving data collection. Continued funding is needed to continue work in support of these objectives.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This is the second year of a collaborative project between the LFFA and DFO targeting improvements to CWT sampling in the area addressing previously low sample rates in terminal fisheries. This project benefits the CWT program by increasing awareness within LFA communities, aiding monitoring organizations to implement changes and build tools to support CWT sampling and data collection, and increasing the number of head samples collected from fisheries.

Summary of head recoveries in Lower Fraser First Nations fisheries, 2010–2012.

Species	2010 FSC[1]	2011 FSC	2011 Econ[2]	2012 FSC
Chinook	8	14	11	19
Coho	0	3	36	16
TBD	0	0	0	2
Totals	8	17	47	37

Note: Retention of Chinook and coho salmon was not licensed in 2012 fisheries with a sales component.
[1] FSC = Food, social, and ceremonial fisheries.
[2] Econ = Fisheries with a sales component.

Project Title: Operational Support for First Nations CWT Sampling Projects

Agency: DFO

Approved funding for this cycle: $25,000

Total CWTIT funding approved to date: $25,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries), Issue 10 (Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables: This project involves hiring a seasonal technician to provide support to the Lower Fraser Area (LFA), DFO, and First Nations monitoring groups targeting increased sampling of Chinook and coho for CWTs and improving collection of supporting mark

rate information. The objectives for this year's funding are listed below.

1. Continue to build the relationship between DFO and the Lower Fraser Fisheries Alliance (LFFA) around CWT sampling in First Nations fisheries.
2. Work with staff from the LFFA on initiatives to increase understanding of the importance of the CWT Program within the LFA First Nations communities and monitoring organizations.
3. Provide support to LFA DFO and First Nations in order to increase the number of head samples collected from LFA First Nations fisheries and work on improving the systems for collection and quality of data on mark rates from LFA First Nations monitoring programs.

Continued CWTIT Funding Needed: Yes. Continued funding is needed to continue work in support of these objectives.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This is the second year of a collaborative project between the LFFA and LFA DFO targeting improvements to CWT sampling in the area addressing low sample rates in terminal fisheries and was the first year funding was provided for DFO technical support. Both this project and the related LFFA funding provided in 2011–2012 and 2012–2013 benefit the CWT program by increasing awareness within LFA communities, aiding monitoring organizations to implement changes and build tools to support CWT sampling and data collection, and increasing the number of head samples collected from fisheries.

Project Title: WCVI First Nations Fisheries Chinook Assessment Enhancements

Agency: DFO

Approved funding for this cycle: $6,000

Total CWTIT funding approved to date: $18,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables: The objective of this project is to improve survey coverage, biosampling rates, estimates of Chinook mark rates and increase head recoveries from WCVI First Nations fisheries. This project improved sampling of the Somass First Nation fishery via support for a technician to collect catch data from the First Nations Economic Opportunity fishery and to sample catch for mark rate recovery and head recovery. This sampling provided an estimate of total catch, mark rate of the catch, and recoveries of heads and CWTs from marked Chinook.

Additional activities include the following.

1. Participate in a First Nations fisheries technician training workshop.
2. Create a MRP/CWT information pamphlet to improve awareness and participation in the program.
3. Purchase freezers and supplies to facilitate sampling and head recoveries.

Continued CWTIT Funding Needed: Yes.

Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program and PSC salmon management include improved estimates of Somass First Nations fisheries impacts on Somass Chinook (CTC indicator stock).

Project Title: Central Coast Chinook Mark Incidence and Catch Estimation Program

Agency: DFO

Approved funding for this cycle: $7,000

Total CWTIT funding approved to date: $10,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sample rates in highly mixed stock fisheries), Issue 10 (Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables: The objectives of this project were to increase survey effort for B.C. Central Coast sport fisheries, including lodge and independent catch, to accomplish the following items.

1. Obtain mark rate data for Central Coast sport fishery which is stratified both spatially and temporally from late June to late August when the majority of Chinook are caught.
2. Estimate independent catch for Areas 7–9 by month using conservation and protection collected independent fisher data.
3. Determine underreporting bias for marked head submission by comparing the lodge logbook mark rates to those collected by conservation and protection.
4. Calculate submission rates for Central Coast sport fishery either through integration of data into MRP or independently.

All objectives were met.

Continued CWTIT Funding Needed: Yes. Without an annual program to collect Central B.C. Chinook mark rate and independent angler catch data, proxy data from other areas would once again be used in MRP to expand CWT recoveries. The deficiencies inherent with this method have been highlighted previously and were the primary reason for initiating this project in 2011.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Immediate benefits have been realized as program results have allowed calculation of Central B.C. (PFMA 7–10) submission rates as well as estimated expansion factors. The availability of these data has precluded the use of mark rates from other areas (global pooling) in DFO's MRP. The observed submission rates during the past two years are higher than proxy data previously used in MRP and corresponding expansion factors are believed to better represent Central B.C. sport fishing impacts on CWT stocks. This project has yielded catch estimates for the previously unaccounted for independent angler (nonlodge based) component of the fishery as well as submission rates and corresponding estimated expansion factors. This recreational fishery is a significant harvester of Chinook (approx. 6,000 in 2012).

Project Title: Operational Support for Recreational CWT sampling projects

Agency: DFO, Kathryn Fraser

Approved funding for this cycle: $30,000

Total CWTIT funding approved to date: $69,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Low sample rates in terminal fisheries), Issue 7 (Low sample rates in highly mixed stock fisheries), Issue 9 (Nonrepresentative sampling), Issue 10 (Incomplete coverage of fisheries or escapement), Issue 11 (Voluntary sport fishery sampling programs)

Project Description, Accomplishments, Results and Deliverables: This project involves hiring two seasonal fisheries technicians to support the implementation of fisheries sampling improvements within the DFO recreational fisheries. Objectives are listed below.

1. Perform audit inspections and recommend improvements to Voluntary Sport Head Recovery Program Depots in Southern B.C.
2. Implement specific recreational fishery sampling improvement projects in Southern B.C. to adequately represent recreational fisheries.
3. Perform public relations and communication with Voluntary Sport Head Recovery Program Depots or fishers in Southern B.C.
4. Perform QA/QC to improve recreational sampling data.

Continued CWTIT Funding Needed: Yes. With the increased workload associated with oversight and delivery of recreational and First Nations sampling programs, continued funding in 2012 is requested, however, long term funding is not required.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This is the second year of funding seasonal fisheries technicians to make improvements to DFO sampling of recreational fisheries. With the addition of a second fisheries technician and seasonal staff, DFO has made significant progress in improving sampling through the voluntary sport head recovery program.

Project Title: Expansion of Catch Monitoring and Sampling in the Southern B.C. Sport Fishery (Operational enhancement of the southern B.C. marine waters recreational creel survey)

Agency: DFO

Approved funding for this cycle: $100,000

Total CWTIT funding approved to date: $280,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries), Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch), Issue 7 (Sampling rates in highly mixed stock fisheries), Issue 8 (Uncertainty in estimates of catch in highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables: This project funded operational enhancements to monitoring of marine recreational fisheries in Southern B.C., including the Strait of Georgia, Juan de Fuca Strait, the West Coast of Vancouver Island and Johnstone Strait. Operational

enhancements took two forms.

1. Conduct creel surveys at times and locations currently unsurveyed to verify assumptions of low Chinook and coho catches.
2. Increase recreational creel survey intensity (creel survey shifts and flight counts) in areas and times previously shown to be important for Chinook catch to improve estimates.

Operational enhancements in the 2011/12 funding year focused primarily on expanding coverage (No. 1 above). The results of this work verified assumptions that Chinook and coho catch rates in unsurveyed periods are low and focus for the project in 2012/13 was shifted to increasing survey intensity during peak catch periods (No. 2 above). Increases in survey interview coverage resulted in higher interview numbers and rates in key recreational fisheries relative to previous years increasing precision in catch per trip estimates. Increases in the number of aerial effort counts improved estimates of effort.

Continued CWTIT Funding Needed: Yes. Continued CWT improvement funding in this area would be used to support transformative improvements to recreational Chinook catch methods, as well as continued increases to creel coverage in key times and areas based on 2011–2012 results. Transformative recreational monitoring work being considered in 2013/14 includes the following.

1. Implement more cost effective internet-based alternative methods to collect data to estimate Chinook catch, particularly in areas and times where creel surveys are inefficient due to low fishing rates or the remote nature of the fisheries.
2. Focus current monitoring efforts to key areas and times to most effectively estimate and sample Chinook catch.
3. Engage the for-hire sport sector to improve the catch, effort and biosample data collected from this professional component of the recreational fishery.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Direct benefits to the CWT program include improved estimates of Chinook (and coho) catch during peak recreational fisheries in the south coast of British Columbia, along with updated catch estimates during periods no longer monitored via creel. Indirect benefits include synergy with other CWT funded projects focused on review and improvements to recreational monitoring approaches and flow of data, particularly marked and unmarked Chinook and coho catch estimates, from field programs to analysts.

Funding pressures for recreational catch monitoring continue to be downward. CWTIP funding through 2012 has assisted in focusing future efforts towards improved cost effectiveness in recreational monitoring while improving our ability to estimate total annual recreational catch in the recreational fishery.

Project Title: Middle Shuswap Sport Fishery Catch Estimation and CWT Sampling

Agency: DFO

Approved funding for this cycle: $16,000

Total CWTIT funding approved to date: $31,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries), Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables: This project is one component of a broader objective to decrease the uncertainty in catch estimates and increase sample rates of terminal fisheries. The aim of this project was to estimate the encounters of Chinook salmon, and other species by clip status, and any other regulation variation that affects the age composition of retained and released catch. 2012 represented the second year of enhanced efforts to survey the recreational and FSC Chinook fisheries as well as promote the CWT program on the Middle Shuswap fishery.

Similar to 2011, there was considerably less effort and catch observed in the 2012 Middle Shuswap Chinook fishery than in past surveys. This was likely due to a management closure implemented to protect Bessette Chinook in 2011 and 2012, high water levels, and late arrival in 2011 and low returns of Chinook to the system in 2012. Although catch and effort has been atypical of past years the project has gained information required to meet objectives.

Continued CWTIT Funding Needed: Yes. Continued support for a multiyear creel survey would continue to build on a number of CWT improvement objectives that include decreasing the uncertainty in estimates of terminal fishery catch, increasing sample rates in terminal fisheries as well as promoting the CWT program.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program include decreasing the uncertainty in estimates of terminal fishery catch, increasing sample rates in terminal fisheries as well as promoting the CWT program. Information from the mid-Shuswap terminal fishery, in combination with other work, provides useful information required to evaluate fishery impacts.

Project Title: Expansion Catch Monitoring and Sampling Chilliwack River Recreational Fishery (Chilliwack River Creel Survey Extension)

Agency: DFO

Approved funding for this cycle: $15,000

Total CWTIT funding approved to date: $30,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries), Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables: The objectives of this project were to expand the coverage of catch monitoring of the Chilliwack River recreational fishery, and to evaluate the performance of indirectly estimating CWT recoveries by comparing them to direct estimates of CWT recoveries using creel survey data.

The Chilliwack River is an exploitation rate indicator stock used by the CTC. A significant recreational fishery targets fall-run Chinook salmon returning to the Chilliwack River. Historically, CWT recoveries from the Chilliwack River recreational fishery for the first half of September were indirectly estimated using the head recovery data and the submission rate measured with creel survey for the last half of September; the accuracy and prudence of this approach has not been evaluated. In 2011, the CWTIP funded DFO to initiate the Chilliwack River Creel Survey project two weeks earlier to allow direct estimates of catch and CWT recoveries for the entire month of September. The study was repeated in 2012. Both the 2011 and the 2012 studies have provided catch estimates, by species and mark status, and an estimate of total angler effort for the September 1–15 period. Additional bimonthly catch and effort estimates have been provided for the September 6 to November 15 period by DFO Fraser Stock Assessment using existing DFO funding. Work is ongoing to compare the 2011 and 2012 September 1–15 period direct and indirect estimates of catch and CWT recoveries.

Continued CWTIT Funding Needed: Yes. Comparison of analytical techniques will occur in early to mid-2013. Deliverables will include a recommendation about the use of indirect estimates of CWT recoveries and catch for any period of the Chilliwack River sport fishery that is not directly assessed.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program include an objective assessment on the CWT data for the Chilliwack River recreational fishery and guidance on use of indirect estimation for this fishery. This project will improve the accuracy of the terminal runs for the CWT indicator stock for 2011 and 2012, and provide advice about the suitability of the indirect estimation method for the Chilliwack River recreational fishery.

Project Title: 2008–2012 Campbell/Quinsam Chinook Mark–Recapture Improvements (assess bias in random mixing of carcass mark–recapture)

Program Agency: Fisheries and Ocean Canada

Approved funding for this cycle: $7,500

Total CWTIT funding approved to date: $37,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Low sample rates in escapement)

Project Description, Accomplishments, Results and Deliverables: CWT improvement funding was used to increase the stream area sampled for CWTs, specifically the Second Island Channel in the Campbell River (2009–2012), allowing more access to carcasses in deep pools. In addition, this project assessed the assumption in a carcass mark–recapture that the tagged and untagged carcasses mix randomly in the population. Two methods were employed and compared.

1. Carcasses were tagged and placed back where they were found (random mixing unlikely unless there was some sort of flood event after that placement).

2. Carcasses were marked and then placed into the flow of the river.

Population estimates derived using the old method were 1–16% less than new method except in 2011 (16% more). In recent years we had three very dramatically different flow conditions in order to evaluate the various release methods. Additional sampling effort and expanded spatial coverage contributed an increase in CWT recoveries on the Campbell River with only a slight reduction in sampling rate on the Quinsam River.

Continued CWTIT Funding Needed: Yes. Continued funding would be of value to maintain the expanded

snorkel coverage on Second Island Channel.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program include an improvement in the accuracy and precision of the mark–recapture estimates of escapement, and increased sampling effort and spatial coverage on the more challenging component of the system resulted in higher CWT recoveries on the Campbell River.

Project Title: 2011–2012 Phillips River Chinook Escapement Estimation and Increase CWT Application

Program Agency: Fisheries and Ocean Canada

Approved funding for this cycle: $10,000

Total CWTIT funding approved to date: $38,000

Continued CWTIT Funding Needed: Yes.

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions), Issue 2 (Determination of tagging levels), Issue 6 (Uncertainty in estimates of escapement)

Project Description, Accomplishments, Results and Deliverables: This production area is not represented by a CTC indicator stock. This project supports existing community partnership efforts to develop an indicator. The two main objectives of this project are listed below.

1. Develop a mark–recapture program on a southern B.C. mainland inlet Chinook population to provide accurate and precise estimates of tagged and untagged Chinook escapement.

2. Increase the number of CWT tags released to 150,000 for this population.

This project involved a two-stage mark–recapture of adult Chinook returning to the Phillips River. Tags were applied via broodstock collection events and seining events. Deadpitch activities were conducted throughout the watershed. There was a significant improvement in the number of tags applied, carcasses recovered, and the precision of the estimate in 2012 relative to 2011. The clipped contribution to the return was estimated at 11.6%.

Preliminary results indicate that escapement estimates have shown improved precision over the last two years and brood collection in 2012 will result in the 150,000 CWT application target being met for release in 2013.

Continued CWTIT Funding Needed: Yes. Based on the recent success and increased CWT tagging it will be key to maintain the program to ensure the recoveries of those tags in the escapement in future years.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program include the following.

1. Develop a low cost indicator program for a Chinook population in the poorly monitored Mainland Inlet Area of the Southern B.C. coast appears feasible.

2. Over the duration of this project it has been demonstrated that we can achieve a precise estimate of Chinook escapement to the Phillips River as well as clipped contribution.

3. This project has demonstrated that increased CWT tag releases to the level of 150,000 are achievable in this remote location.

Project Title: Cowichan Chinook Assessment Enhancements

Agency: DFO

Approved funding for this cycle: $30,000

Total CWTIT funding approved to date: $120,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement), Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch), Issue 10 (Incomplete coverage of escapement areas)

Project Description, Accomplishments, Results and Deliverables: The objective of this project was to improve escapement survey effort and coverage, biosampling rates, estimates of Chinook mark rates, and increase head recoveries from escapement to Cowichan River. This improved escapement sampling complements increased tagging rates in Cowichan Chinook.

In 2012 drought conditions resulted in extremely low waters in Cowichan River until mid-October. Low water led to poor migration conditions and increased the potential for Chinook spawning in the lower river. This project supported additional deadpitch monitoring activities in the lower river in 2012 and greater sampling rates of carcasses from a wider area relative to the standard program.

In 2012, 577 carcasses were sampled, resulting in 569 scale samples, 145 adipose-fin-clipped Chinook (141 heads collected and submitted for processing), and a recapture of 46 marked carcasses. Forty-two carcasses (7.3%) were collected outside of the normal sampling area, and would not have been sampled without this project. Overall, 15% of the 3,730 adults and jacks' natural spawners estimated to have migrated past the fence were sampled by deadpitch crews.

Continued CWTIT Funding Needed: Yes

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program and PSC salmon management include improved escapement survey coverage, biosampling, and head recovery rates, resulting in improved accuracy and precision of escapement estimates for the Cowichan River.

Project Title: Improved CWT Recovery, Chilliwack River Indicator Stock Program

Agency: DFO

Approved funding for this cycle: $14,000

Total CWTIT funding approved to date: $56,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables: This project provided additional staff on the Chilliwack River Chinook deadpitch program to increase survey frequency and the probability of recovery of carcasses. As a direct result, CWT recoveries were increased relative to expected at base survey frequency, thus increasing the precision of estimation of escapement by tag code.

Continued CWTIT Funding Needed: Yes. Loss of continued funding for this project will result in reduced CWT recoveries, thus estimates of return by tagcode will become less precise.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, the prevalence of carcasses of other species, fluctuating water levels, predators, and a host of other factors. Carcass sampling rates on the Chilliwack River tend to be hindered by high flows and large escapements of chum salmon, which result in considerable extra effort being required to find and recover carcasses of Chinook. Increased Chinook carcass recoveries result from the increased sampling effort, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater in years of more unstable flows and larger chum salmon returns.

Project Title: Improved CWT Recovery, Harrison River Indicator Stock Program

Agency: DFO

Approved funding for this cycle: $16,000

Total CWTIT funding approved to date: $64,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables: This project provided funding for additional effort to expand marking and recovery effort during Harrison River Chinook mark–recapture study, thus increasing the sampling rate and precision of the mark–recapture estimates.

Continued CWTIT Funding Needed: Yes. Loss of continued funding for this project will result in reduced CWT recoveries, thus estimates of return by tag code would be less precise.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: It is difficult to quantitatively assess success due to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, the prevalence of carcasses of other species, fluctuating water levels, predators, and a host of other factors. Carcass sampling rates on the Harrison River tend to be hindered by high water levels and large escapements of chum salmon, which result in considerable extra effort being required to find and recover carcasses of Chinook. Increased Chinook carcass recoveries result from the increased sampling effort, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater in years of more unstable flows and larger chum salmon returns.

Project Title: Improved CWT Recovery, Nicola River Indicator Stock Program

Agency: DFO

Approved funding for this cycle: $8,000

Total CWTIT funding approved to date: $32,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables: This project provided funding for contracting additional staff to expand recovery effort and sampling frequency during the Nicola River Chinook deadpitch. By increasing the frequency at which the entire 50 km of river are surveyed, sampling rate was increased as carcasses are sampled prior to predator removal, thus increasing the sampling rate and precision of the mark–recapture estimates.

Continued CWTIT Funding Needed: Yes. Loss of continued funding for this project will result in reduced carcass and CWT recoveries due to predator removals, thus reducing the precision of the escapement estimate and CWT recoveries.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, predators and other factors. Carcass sampling rates on the Nicola River tend to be hindered at escapements less than 10,000 due to the effects of predators. Until predator response is saturated, increasing recovery effort yields increased carcass recoveries by increasing the chances of encountering carcasses before predators, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater at depressed escapements.

2012 U.S. Project Reporting

A total of 12 U.S. projects were funded in FY 2012, inclusive of one using funding from FY 2011 (Table L2). The total expenditure of U.S. CWTIT projects in 2012 was $1,529,685, $1,500,000 from FY 2012 funds and $29,685 from FY 2011 funds. Below the table are summaries for each individual project, including a description of the project, deliverable benefits to the CWT system, and the issue covered in PSC Technical Report 25 (PSC 2008). Included is one project originally funded in 2010, but completed during this cycle, regarding a decision-theoretic to help guide future funding decisions for tagging stocks and sampling fisheries.

Table L2. U.S. CWT Project Expenditures for 2012–2013, approved in February, 2012.

Project Category	TR25 Issue	Project Title	Cost
Indicator hatchery stock tagging, terminal fishery and escapement # and sampling	1,3, 4, 6	Mid-Oregon Coast CWT Recovery, and Escapement of Elk River Fall Chinook[1]	$123,501
CWT Lab equipment purchase	13	Purchase of Microscope and Related Lab Equipment	$5,312
Database and reporting system upgrade	13, 14, 17, 18	Oregon Department of Fish and Wildlife CWT Database Program System	$110,000
Low sample rates in terminal fisheries and estimation of harvest	4, 6	CWT Harvest Estimation in Puget Sound Freshwater Chinook Sport Fisheries[1]	$185,122
Indicator stock tagging of wild stock without hatchery representation	1, 2	Stikine River Chinook Smolt CWT –Bilateral[1]	$121,883
CWT data reporting system improvement	8, 9	Spring Troll Restratification in SEAK	$29,685[2]
Replace outdated CWT equipment	12, 13	Replace Oregon Department of Fish and Wildlife Outdated Handheld CWT Wand Detectors[1]	$80,710[3]
Reduce head processing costs and improve sampling efficiency	4, 7, 13	Purchase Commercial Port Sampling Wands in SEAK	$131,309[3]
Replace outdated CWT equipment	12, 13	Replace WDFW Outdated Handheld CWT Wand Detectors[1]	$230,726[3]
CWT data reporting system improvement	13, 15, 17	Improve Timeliness of Washington Catch and Sample Datasets for CWT expansion	$72,206
Low sample rates in mixed-stock fisheries	7	Sampling Washington Ocean Salmon Fisheries[1]	$339,400
Low sample rates in mixed-stock fisheries	7, 13	Improvements to Oregon Ocean CWT Sampling in Columbia River Management Area	$100,101
		U.S. Total	**$1,529,685**

[1] Multiyear.

[2] Project to be funded with remaining FY11 funds.

[3] Wands will be purchased through WDFW; $401,521 total includes 26 SEAK wands @ $3,465 each ($90,085 total), 30 Oregon Department of Fish and Wildlife wands @ $2,690 each ($80,710 total), and 85 WDFW wands @ $2,690 each ($230,726 total). SEAK total includes funding for training, validation and sampling.

Project Title: Decision-Theoretic Tool (D-T) For Improving the CWT Program

Agency: MORI-ko, LLC (through Northwest Indian Fisheries Commission), Gary Morishima

Approved funding for this cycle: None

Total CWTIT funding approved to date: $141,586

Continued CWTIT Funding Needed: Not unless additional modifications or refinements are requested from user feedback

Objectives and Relationship to PSC Technical Report 25: Chapter 6: The CWT expert panel and CWT workgroups recommended that a Decision Theoretic Tool be developed.

Project Description, Accomplishments, Results and Deliverables: Produce a D-T tool to guide modifications to the CWT program as recommended by the CWT Expert Panel.[1] The proposed tool would be designed to simultaneously analyze interdependencies between investments involving CWT marking, sampling, and catch/estimation programs on multiple stocks and fisheries in terms of quantitative estimates of improvements in selected PSE/CVs of exploitation rates. Uncertainty surrounding estimates of exploitation rates would be computed using methods described by Bernard and Clark[2] and Chapter 5 of the CWT Workgroup Report.[3] The tool, largely based on the guidance provided in Appendix B of PSC TR25, would consist of four primary components: (1) a menu driven interface to enable users to select the types of statistics to be produced (e.g., stock-age-fishery, total fishery exploitation rate); (2) a simple, steady-state forward cohort model to approximate CWT recovery patterns resulting from changes in survival and fishery harvest rates from base period levels; (3) a module to estimate CVs, given tagging levels, sampling rates, and uncertainties surrounding catch/escapement estimates; and (4) an optimization module to allocate expenditures for proposed projects to improve the CWT program. The D-T tool would be parameterized using CWT data and fishery strata employed by the CTC.

Funding was not received until September 2010, delaying initiation of the project. CWTIT was consulted during development and modifications made as requested. The tool, named Plan It! (PI!), was completed early in 2012. Executable and source code, user guide, manual, and report have been delivered. The D-T project was originally proposed to be developed in the R statistical system, but was written as a stand-alone Visual Basic program since that is the primary language that is utilized by the CTC.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management:

1. Increased visibility and awareness of costs and benefits of modifying or investing in improving CWT programs
2. Improved allocation and use of limited funding to support CWT programs and increased awareness of the implications of CWT programs undertaken by one agency on other jurisdictions

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[1] Pacific Salmon Commission. 2005. Report of the expert panel on the future of the coded wire tag program for Pacific Salmon. Pacific Salmon Commission Technical Report No. 18. http://www.psc.org/pubs/psctr18.pdf (Accessed February 4, 2014).

[2] Bernard, D. R., and J. E. Clark. 1996. Estimating salmon harvest based on return of coded-wire tags. Canadian Journal of Fisheries and Aquatic Sciences 53:2323-2332.

[3] PSC (Pacific Salmon Commission). 2008. An Action Plan in Response to Coded Wire Tag (CWT) Expert Panel Recommendations. A Report of the Pacific Salmon Commission CWT Workgroup. Pacific Salmon Commission Technical Report No. 25. http://www.psc.org/pubs/psctr25.pdf (Accessed February 4, 2014).

Project Title: Stikine River Chinook Smolt CWT

Project agency: ADF&G (note this project is also funded by Canada), Phillip Richards

Approved funding for this cycle: $121,883

Total CWTIT Funding approved to date: $356,965

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions), Issue 2 (Determination of tagging levels)

Project Description, Accomplishments, Results and Deliverables: This bilateral project was designed to represent the Stikine River population of Chinook salmon, which averages run sizes of about 50,000 adults, and to increase the level of CWT tagging of smolts to 35,000 or more annually. In addition, approximately 2% were measured for weight and length. The tagging goal has been reached each year. Returning adults are sampled in marine fisheries, with most CWTs recovered in SEAK sport, gillnet and troll fisheries near Petersburg; fewer numbers are recovered in other areas of SEAK and NBC. The escapement and inriver fisheries are sampled to determine the marked rate by brood year, which provides a basis to estimate harvest contributions, exploitation rates, smolt and adult abundance, and survival rates. The U.S. has paid the bulk of funding for the CWT portion of this program since its inception. Canada has paid for the bulk of escapement recoveries since its inception.

Continued CWTIT Funding Needed: Yes. Tagging rates could not have been achieved without this funding source.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: This program, along with the inriver run and escapement estimation program (funded by other sources) provides the tools to forecast and manage the terminal run of this stock per Chapter 1 of the 2009 Pacific Salmon Treaty Agreement.

Success: Yes; and additional data will be available when recently tagged broods recruit to fisheries in the future.

Project Title: Mid-Oregon Coastal Production Region CWT, Recovery and Escapement Estimation of Elk River Fall Chinook Salmon

Project agency: Oregon Department of Fish and Wildlife, Shelly Miller

Approved funding for this cycle: $123,501

Total CWTIT Funding approved to date: $376,184

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions), Issue 3 (Representation of hatchery production), Issue 4 (Low sample rates in terminal fisheries), Issue 6 (Uncertainty in estimates of escapement or terminal fisheries)

Project Description, Accomplishments, Results and Deliverables: Oregon Department of Fish and Wildlife (ODFW) considers the Elk River CWT Chinook Salmon Program as a candidate exploitation rate indicator stock for the Mid-Oregon coast aggregate. As such, it is critical to estimate the number of CWT Chinook salmon in the terminal run by sampling the freshwater harvest and spawning escapement thus continuing historic data collection efforts to characterize the Chinook salmon run in the Elk River.

Specific objectives include the following.

1. Conduct a statistical creel survey to sample harvested Chinook salmon and provide estimates of terminal catch within a usable time frame for fisheries management.
2. Assist with broodstock and hatchery collection and processing to recover CWTs from returning Chinook salmon adults.
3. Sample spawning grounds to recover a sample of escaping hatchery origin, tagged Chinook salmon.
4. Survey spawning areas to provide an estimate of spawning escapement of returning hatchery, CWT and naturally produced fish.
5. Tag (CWT) and remove adipose fins from approximately 325,000 Elk River fall Chinook salmon annually to provide harvest and escapement estimates in subsequent return years. Work under CWTIT funding for 2012–2013 is still ongoing but is on target for successful completion. As of Dec. 6, 2012, all aspects of the 2012 Elk River project are in progress and results should be available in March of 2013. Creel technicians have sampled 589 Chinook and collected 136 snouts. Spawning ground surveys are now in full rotation with peak spawner activity expected in January. Swim-in totals at the hatchery thus far include 930 adult males, 335 females and 142 jacks, with nearly 800 snouts collected that tested positive for CWT. The application of CWTs to approximately 300,000 hatchery smolts from the 2012 brood is scheduled for late spring of 2013.

Continued CWTIT Funding Needed: Yes. This program is necessary for the proper estimation of CWT Chinook salmon, by tag code, that return to Elk River between 2010 and 2015 to assess ocean survival, ocean and freshwater harvest and spawner escapement.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Without consistent representation, the Mid-Oregon Coast (MOC) aggregate of fall Chinook stocks will not be adequately accounted for nor appropriately modeled for their contribution to Pacific Salmon Treaty fisheries. Recent evidence demonstrates that the Elk River stock is a significant contributor to aggregate abundance based management (AABM) fisheries. The past three years of CWTIP support have provided consistent exploitation rate indicator stock representation of the MOC aggregate, an important contributor to Pacific Salmon Treaty fisheries. This project directly relates to the CWTIT RFP 2012 Cycle Themes E and F: Terminal Fishery Escapement Sampling Issues and Tagging Issues, respectively. Completion of the proposed work will augment the existing CWT program by providing consistent estimates of distribution and exploitation rates for MOC stocks.

Success: Yes; and additional data will be available when recently tagged broods recruit to fisheries in the future.

Project Title: Oregon Department of Fish and Wildlife, CWT Database Program Support Systems

Project agency: Oregon Department of Fish and Wildlife, Mark Engelking

Approved funding for this cycle: $110,000

Total CWTIT Funding approved to date: $520,000 on Oregon Department of Fish and Wildlife CWT Reporting System

Continued CWTIT Funding Needed: Probable

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of reporting), Issue 14 (Incomplete/no exchange of CWT data), Issue 17 (Updating data is difficult and updates cannot be tracked), Issue 18 (Validation is inadequate)

Project Description, Accomplishments, Results and Deliverables: There are two aspects to the project. First is the conversion of existing CWT historic data and processes for ocean fisheries to newer web-based technology (SQL c#.net) used by the CWT F application. This conversion will improve management of CWT data and report recoveries promptly. Second, paper forms and the manual data entry processes for CWT recovery and release information from hatcheries are to be replaced by data loggers and software programs that will provide electronic data uploads to the CWT F application database.

The Agile Software Development process of adaptive and interactive software development was successfully used in the development of the CWT F application. Developers have successfully programmed a data logger to capture CWT recovery data from Bonneville Hatchery and upload it to the CWT F application. Parallel testing at Bonneville Hatchery of this recovery program is in progress. Development for CWT release programs is ongoing. Data loggers that are both durable in field conditions and compatible with Microsoft Mobile 6 software have been identified and will be purchased. ODFW has defined 85 development stories for transforming those PC computer-based processes to web-based technology. Reports to support the ocean fisheries programs are in development and testing. Migration of historic information from the MRP is in process to the CWT F application. The CWT F application is now modified to accommodate Ocean fisheries data and migration of historic information is underway.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Timeliness of reporting, access and retrieval of CWT data, updating of CWT data will be easier and can be tracked and validation and accuracy of CWT data from Oregon will all be improved once these improvements are complete and implemented.

Success: Likely Yes, but the project is still in progress.

Project Title: Improving Timeliness of Reporting Washington's Catch and Sample Datasets for CWT Expansions

Project agency: WDFW, Brodie Cox

Approved funding for this cycle: $72,206

Total CWTIT Funding approved to date: $307,725 on WDFW CWT Reporting System

Continued CWTIT Funding Needed: Unknown

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting), Issue 15 (Inter/intra-agency coordination), Issue 17 (Updating data is difficult)

Project Description, Accomplishments, Results and Deliverables: This solution will enhance future WDFW near real-time recovery reporting capabilities. This should improve the timeliness of postseason analyses. Future work in this area will involve developing an interface for use by field personnel, thereby creating a fully integrated system of data entry and retrieval, and provide for statewide standardization of CWT reporting.

CWT Recovery Workflow: (1) CWTs heads collected in the field, (2) CWTs analyzed in the Tag Recovery Lab, (3) data is entered into the recovery database, and (4) as the heads are processed and instantly (*more or less*) reported via data.wa.gov/ Salmon Conservation Reporting Engine (SCoRE). Researchers and fishery scientists have access to raw recovery data in a timely manner.

Old System, Grade: approximately 6 (scale of 1–10 with 10 being best): The database improvements affect the third step in the simplified recovery workflow. The old system was designed quite some time ago, and although it had been migrated to SQL Server in 2009, it was nonstandard structure and was not connected/connectable to other data sets, including the Tagging Application operational database (Tagwire). Reporting of recoveries is via request to the data steward or at twice yearly time of Regional Mark Information Centre reporting.

New system, approximately 8 (scale of 1–10 with 10 being best): This project modernizes, simplifies and standardizes both the Tag Recovery lab database as well as the TagWire database. Additionally It adds an automated and accessible reporting component for displaying inseason recoveries a as they are processed. Changes to the system are as follows.

- Migrated tagging crew operational database to agency standard format.
- Mapped the SQL Server database objects used in the MS Access user interface.
- Separated all the database objects that are required by the MS Access user interface and move them into a new database. This includes scripting the stored procedures, views, functions, and the like, to individual files to be checked into source control (CVS). This also includes modifying the MS Access user interface to use the new database.
- Refined storage procedures. Further investigation revealed a total of 184 stored procedures (many redundant) which our dev. team was able to reduce to 62 stored procedures.
- Lookups successfully migrated to Agency common lookup set.
- Developed 'Live' export web service available via Data.wa.gov

Improvements in timeline:

- *Before:* Recovery data is available every 6 Months (or recovery data on request via steward)
- *After:* Recovery data (nonreconciled) available daily via https://data.wa.gov/

Ongoing Work:

- Availability of recovery data via Data.Wa.gov anticipated by the time end of December 2012
- Availability of recovery data via SCoRE II in Spring of 2013

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Timeliness of reporting, access and retrieval of CWT data from Washington will all be improved.

Success: Yes.

Project Title: SEAK Spring Troll Reporting Restratification

Project agency: ADF&G, Ron Josephson and Tim Frawley

Approved funding for this cycle: $29,685

Total CWTIT Funding approved to date: $29,685

Continued CWTIT Funding Needed: No

Objectives and Relationship to PSC Technical Report 25: Issue 8 (Uncertainty in estimates of catch in highly mixed stock fisheries), Issue 9 (Nonrepresentative sampling)

Project Description, Accomplishments, Results and Deliverables: This project's objective was to reduce the number of time and area strata in the spring troll fishery in SEAK to reduce errors in expansions of CWTs from this fishery. This fishery is primarily managed to maximize the harvest of returning Alaska hatchery Chinook and over 200 time/area strata are employed in the management plan for this fishery. The number of strata was reduced by 80% by lumping weekly strata into 2 periods, May and June. This eliminates most of the strata with no fish sampled and eliminates expansions with less than 1 fish. Data exploration is complete and programming is underway to complete the transition, which will be complete by spring of 2013. Historical estimates will be updated as well; overall estimates change very little, but the precision of estimates increases substantially.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Precision of CWT estimates from the spring troll fishery in SEAK will be improved and more in line with the summer and winter troll fishery estimates.

Success: Yes, but the project is incomplete for the programming stage.

Project Title: Purchase of Microscope and Related Equipment for CWT Lab

Project agency: The Makah Tribe, Hap Leon

Approved funding for this cycle: $5,312

Total CWTIT Funding approved to date: $5.312

Continued CWTIT Funding Needed: No

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of reporting)

Project Description, Accomplishments, Results and Deliverables: The objective of this project is to improve the efficiency of reading CWTs in the Makah Fisheries tag lab, by providing an electronic microscope with an LCD display. This equipment should allow for faster, clearer tag reading, as well as providing ergonomic benefits to the tag reader. The equipment was purchased after some difficulties in obtaining funds and it has worked well in the speed and ease of reading CWTs collected from the Makah

Tribe salmon fisheries. This data is shared with the tribal staff and managers and then sent to the WDFW for transfer to the Regional Mark Processing Center.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: The timeliness of reading tags from the Makah fisheries has been improved and this will likely translate into a faster upload to the Regional Mark Processing Center as well.

Success: Yes.

Project Title: CWT Field Equipment Replacement—Handheld Wands

Project agency: WDFW, John Kerwin

Approved funding for this cycle: $230,726

Total CWTIT Funding approved to date: $230,726

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing), Issue 13 (Timeliness of reporting)

Project Description, Accomplishments, Results and Deliverables: WDFW has approximately 500 CWT detection wands in current inventory. The WDFW sampling database lists approximately 240 sampling locations where Chinook and coho are sampled for CWTs. Additionally, streams and rivers in every major river basin, as well as all WDFW hatchery facilities are surveyed annually for Chinook and coho that contain CWTs. All of these locations require the necessary equipment to allow for adequate sampling of both marked and unmarked CWTd fish. The purchase of 85 CWT detection wands represents the first influx of the new technology and significantly more sensitive wands for WDFW samplers to utilize.

Because funding for the purchase of the CWT detection wands was not received in time to purchase the wands for the 2012 Chinook fishing season, WDFW has not placed the wands into service. However, it has allowed us to plan the most efficient method to deploy the new CWT detection wands. These wands will be utilized at port sampling locales that have high numbers of Chinook sampled. This will involve replacing CWT detection wands first at the Washington coastal and Puget Sound sampling locations that have the highest levels of Chinook sampling.

Because there are CWT detection wands that are at other locations which are unreliable, WDFW will make an assessment of the CWT detection wands turned in by port samplers and use the most useful to replace the unreliable CWT detection wands. For example, some wands have been retrofitted with shields while others have not. WDFW will replace nonretrofitted wands with reliable retrofitted wands.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Increased accuracy of detecting CWTs in sampling using handheld wands. Some increase in speed and efficiency of sampling should be realized as well.

Success: Yes, the wands were purchased and will be used for the 2013 season for Washington fisheries.

Project Title: CWT Field Equipment Replacement—Handheld Wand

Project agency: Oregon Department of Fish and Wildlife, Ken Johnson

Approved funding for this cycle: $80,710

Total CWTIT Funding approved to date: $80,710

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing), Issue 13 (Timeliness of Reporting)

Project Description, Accomplishments, Results and Deliverables: Oregon Department of Fish and Wildlife (ODFW) was able to purchase 30 new handheld wands at a significant discount by partnering with WDFW's order of 85 handheld wands. The lower cost per wand was a result of WDFW's waiver of indirect charges for this purchase.

Oregon's Fish Identification Section received 30 new wands in mid-September, 2012. Twenty wands were then delivered to Oregon's Ocean Sampling Program, headquartered in Newport. Ten wands were delivered to Oregon's Columbia River Management program which samples lower Columbia River commercial and sport landings for CWT marked Chinook and coho.

The new wands arrived at the end of the fisheries in the Columbia River and the ocean. As such, the new wands were not been rigorously tested in field sampling. However, preliminary results indicate that samplers appreciate the ergonomic balance of the redesigned wands. In addition, it is very clear that the new wands are much more sensitive and eliminate the need for mouth wanding in large Chinook. Full scale use of the wands will start with Oregon's spring 2013 fisheries.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Increased accuracy of detecting CWTs in sampling using handheld wands. Some increase in speed and efficiency of sampling should be realized as well.

Success: Yes, the wands were purchased and will be used for the 2013 season for both Washington and Oregon fisheries.

Project Title: SEAK Port Sampling Tag Detection Wands and Sampling/Training

Project agency: Alaska Department of Fish and Game, Anne Reynolds

Approved funding for this cycle: $131,309

Total CWTIT Funding approved to date: $131,309

Continued CWTIT Funding Needed: Yes, for additional sampling time but not for additional equipment

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing), Issue 13 (Timeliness of reporting)

Project Description, Accomplishments, Results and Deliverables: The primary objective of this project was to purchase 26 new handheld wands from Northwest Marine Technology, Inc. and add sampling effort and training to increase CWT sample rates and decrease shipping costs in SEAK commercial fisheries. Additional fish and wildlife technicians and one biologist in the ports of Sitka and Craig were supported. Staff were trained and the new wands were tested during the spring troll fishery, whereby all adipose-clipped fish were shipped to the ADF&G Mark, Tag, and Age Laboratory regardless of tag detection status. In May of the spring fishery, some minor errors in false negatives occurred due to

protocol lapses, but accounted for 0.1% of adipose-clipped fish. In June, these errors were eliminated and heads tested without CWTs were not shipped. Port samplers in all ports except for Hoonah and Excursion Inlet used electronic tag detection wands to examine adipose-clipped Chinook salmon harvested in the summer Southeast Alaska troll fisheries to determine if valid CWTs are present before CWT processing protocols are invoked. The heads of any positively identified tagged fish were collected and the tags decoded by ADF&G staff. During the first summer troll Chinook retention period in July of 2012 port samplers observed 3,138 Chinook salmon missing their adipose fin. Using Northwest Marine Technology, Inc. electronic tag detection wands, 2,105 of those Chinook salmon missing their adipose fin did not signal positively indicating the presence of a CWT. During the second troll Chinook retention period in August of 2012 port samplers observed 3,657 Chinook salmon missing their adipose fin. Of those, 1,948 (53%) Chinook salmon did not signal positively indicating the presence of a CWT. In total 4,053 Chinook salmon heads were not shipped to the ADF&G Mark, Tag and Age Laboratory saving the department shipping costs on approximately 8,000 lb of salmon heads. Sampling rates of the summer troll fishery remained above the coastwide standard, and overall were above 30% for Chinook salmon harvested in the troll fisheries. The additional port sampling staff funded by this project contributed to this sampling effort.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Costs were reduced for shipping heads without CWTs (no tags) in SEAK commercial fisheries, primarily troll-caught Chinook salmon. This also maintained sampling rates above 20% and contributed to increased sampling efficiency.

Success: Yes, the wands were purchased and will be used for the 2013 season for Alaska fisheries.

Project Title: CWT Sampling and Harvest Estimation in Puget Sound Freshwater Chinook Sport Fisheries, Sampling Methods and Development of New Analytical Techniques

Project agency: WDFW, Kris Ryding

Approved funding for this cycle: $185,122

Total CWTIT Funding approved to date: $550,401

Continued CWTIT Funding Needed: No, last of 3-year program

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries), Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables: This project involves conducting intensive creel surveys on four freshwater Chinook fisheries in Puget Sound for the purposes of developing indirect estimates of tagged fish by age. This project examines differences between harvest estimates obtained from creel surveys and catch record cards. This information is used to compare the number of expanded CWTs from a sampled sport fishery with expected CWT numbers for the same fishery obtained using indirect estimation. The objectives for this year's funding are listed below.

1. Continue to make refinements to creel sampling methodology, focusing on efficient use of resources, ensuring that data are representative of fishing activity, and that sampling rates are adequate to meet data quality criteria.
2. Collect enough CWTs in the sampled fishery so that comparison to indirect methods can be made.
3. Compare harvest estimates obtained from creel sampling with those calculated from catch record cards.

4. Compare direct and indirect methods of estimating the numbers of CWTs in the sampled fisheries.
5. Examine the consistency of catch numbers and CWT recoveries across years in order to evaluate using average recovery and catch values in CTC models when harvest estimates are not yet available.

The objectives of this proposal are to add one more year of data to the analysis making it possible to do across year comparisons of harvest estimates and CWT recoveries within the same fishery.

Deliverables will be a set of fishery specific recommendations on the use of indirect and direct analytical techniques, and on the use of average recovery and catch values in CTC models when harvest estimates are not yet available. Thus far, objectives 1 and 2 have been accomplished. Objectives 3 through 5 will depend on the outcome of analyses that depend on 2012 catch record card estimates not available until late 2013. This project should be successful in meeting its objectives.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: Benefits to the CWT program include an objective assessment on the information coming from freshwater fisheries data in Puget Sound, and guidance on which data sources will be most useful in evaluating impacts from these fisheries. Efficiencies are in savings from not sampling the fisheries directly each year and estimation of CWTs using indirect methods.

Project Title: Sampling Washington Ocean Fisheries

Project agency: WDFW, Doug Milward

Approved funding for this cycle: $339,400

Total CWTIT Funding approved to date: $692,500

Continued CWTIT Funding Needed: Yes, and other funding preferred

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sampling rates in highly mixed-stock fisheries)

Project Description, Accomplishments, Results and Deliverables: This project addressed the priority activity identified by the CWTIT for improving sampling rates in highly mixed-stock fisheries (fisheries with multiple stocks). The activities of this project include catch sampling and collection of Chinook and coho salmon biological data including CWTs from commercial and recreational fisheries conducted along the coast of Washington State. During the 2012 ocean recreational salmon fisheries, the objectives of this project were accomplished. All ocean salmon fisheries were fully sampled temporally and spatially, and the minimum sampling goal of 20% of landed Chinook and coho was exceeded in all fisheries. Sampling rates for most species/fishery combinations increased relative to 2011. Over 3,600 Chinook CWTs and 1,500 coho CWTs were collected and will be added to the Regional Mark Processing Center database.

WDFW Chinook sampling rates are approximately 45% in the recreational ocean salmon fishery and 42% in the non-Treaty commercial troll ocean salmon fishery. Chinook sport fisheries were sampled at about 45%, gleaning a sample size of 15,081 from an estimated catch of 38,581. Chinook troll fisheries were sampled at a rate approximate to 42%, providing a sample of 15,401 from an estimated catch of 36,855 landed Chinook. Coho sampling rates were similarly high, at 52% in the recreational ocean salmon fishery and 28% in the non-Treaty commercial troll ocean salmon fishery.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: No new

benefits, but this is a program with past success that was repeated for base sampling in 2012.

Success: Yes, sampling rates for sport was 45% and that for commercial troll was 42% in 2012.

Project Title: Improvements to Oregon Ocean CWT Sampling of Commercial Troll and Recreational Fisheries in the Columbia River Ocean Salmon Management Area

Project agency: Oregon Department of Fish and Wildlife, Eric Schindler

Approved funding for this cycle: $101,101

Total CWTIT Funding approved to date: $201,237

Continued CWTIT Funding Needed: Yes, and other funding preferred

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sampling rates in highly mixed-stock fisheries), Issue 13 (Timeliness of reporting)

Project Description, Accomplishments, Results and Deliverables: The primary objectives of this project (initially begun with the 2011 ocean salmon fishing seasons) have been to implement full electronic sampling for CWTs and maintain the minimum required CWT sampling rate of 20% with emphasis on Chinook salmon in Oregon's ocean salmon fishery in the Columbia River Ocean Salmon Management Area. Implementation of this required a uniform approach for the entire Oregon ocean salmon fishery.

The objectives have been met and the project has been a success to date, although overall catches during the period have remained relatively light and some challenges to maintaining sampling rates in the commercial salmon fishery are yet to be faced. In the 2012 ocean commercial troll salmon fishery through August, we had recovered readable tags from 330 unmarked Chinook (76 from the Columbia River Area), and these tags would not have been recovered without the support from CWTIT. An unexpected benefit has been the recovery of tags from unmarked Chinook that were supposed to have been marked (missed clips or regenerated adipose fins may be the cause). Based on the tag recoveries from California stocks these unclipped recoveries of Chinook made up approximately 1% of the total recoveries.

Tag recoveries from PSC stocks accounted for approximately 73% of the CWTs recovered in the Columbia River Area and approximately 29% of the CWTs recovered South of Cape Falcon. Unmarked CWT Chinook make up a decreasing percent of the CWTs recovered to the South, but are still made up ≥50% of the CWT recoveries as far South as the Coos Bay Area.

Qualitative and Quantitative Benefits to CWT Program and PSC Salmon Management: The proponents indicate that about 50% of this project is enhanced CWT program benefits because of full electronic sampling that is being employed.

Success: Yes, the sampling rates were high, about 45% for sport and troll.